



Orion 8010cX Ammonia Analyzer

User Manual

CIC0004053-01 • Revision C • January 2021

IMPORTANT Read this instruction manual. Failure to follow the instructions in this manual can result in damage to the unit, injury to operating personnel and poor equipment performance.

CAUTION All internal adjustments and maintenance must be performed by qualified service personnel.

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Preface

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Read through the information given in these operating instructions on installing and operating the system before you begin installation and use of your "Ammonia Analyzer". This is of particular importance, as we, the manufacturer, do not assume any liability for damage due to incorrect operation or use of the system other than the intended use.

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Warranty Information

Thermo Fisher Scientific warrants to the original purchaser of any new merchandise that all items will be free of defects in material and workmanship for the periods set forth below, when used under specified and normal operating conditions, in accordance with the operating limitation and procedures given in the instruction manuals, and when not subjected to accident, alteration, abuse or misuse of Thermo Fisher Scientific's products in unspecified applications, for unauthorized procedures, or with third-party products may void the warranty.

Thermo Scientific's instruments are warranted as follows:

All parts in contact with the sample for a period of ninety (90) days from the date of installation. Sample must be chemically compatible with parts ordered with the product. If parts are not compatible or if a question exists regarding compatibility, notify the factory before placing the product in service to maintain the warranty.

Parts not in contact with sample for a period of 12 months from the date of installation or 15 months after the date of shipment.

Tubing for a period of thirty (30) days under normal operation.

THE WARRANTIES DESCRIBED ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER STATUTORY, EXPRESSED OR IMPLIED. ALL OTHER WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE, EXCEPT TITLE, ARE HEREBY OVERRIDDEN AND

EXCLUDED. NO LIABILITY SHALL ATTACH TO THERMO SCIENTIFIC EITHER IN CONTRACT OR IN TORT, FOR ANY PERSONAL INJURY, DEATH, DAMAGE TO PROPERTY, LOSS OF PROFITS, DAMAGES, COSTS, CHARGES, LIABILITIES OR EXPENSES, WHETHER DIRECT OR INDIRECT, CONSEQUENTIAL OR OTHERWISE, WHICH ARISE OUT OF OR IN CONJUNCTION WITH THE SALE OR USE OF THIS PRODUCT.

The sole and exclusive remedy of the customer is the return of defective components or sub-assemblies to Thermo Fisher Scientific for repair or replacement or, at Thermo Fisher Scientific's option, refund of the purchase price. For the most current warranty information, visit www.thermofisher.com/water.

Warranty on Shipments / Returns / Adjustments

A warranty claim must be made promptly and must be received during the applicable warranty period by Thermo Fisher Scientific or your authorized Thermo Fisher Scientific distributor. If it becomes necessary to return a product for repair and / or adjustment, prior authorization from Thermo Fisher Scientific or your Thermo Fisher Scientific- authorized distributor must be obtained. Instructions as to how and where these products should be shipped will be provided by Thermo Fisher Scientific or your Thermo Fisher Scientific-authorized distributor.

Any product or component returned for examination and / or warranty repair shall be sent to Thermo Fisher Scientific in MA, or any of their authorized representatives. All items must be returned at the customer's cost (freight prepaid), quoting a return authorization number that is available from the Service department. All products or components repaired or replaced under warranty will be returned to the customer at Thermo Fisher Scientific's cost.

In all cases, Thermo Fisher Scientific or your Thermo Fisher Scientific-authorized distributor has sole responsibility for determining the cause and nature of failure, and Thermo Fisher Scientific's or the distributor's determination with regard thereto shall be final. All parts that are replaced under warranty will become the property of Thermo Fisher Scientific.

Limited Warranty

Out of Warranty Service

Proceed exactly as for Warranty Service above. If our service department can assist you by phone or other correspondence, we will be glad to help at no charge.

Repair service will be billed on the basis of labor and materials. A complete statement of time spent and materials used will be supplied. Shipment to Thermo Fisher Scientific should be prepaid. Your bill will include return shipment freight charges.

Disassembly by the user is prohibited. Service should only be carried out by experienced Thermo Fisher technicians.

Repair Facilities and Parts

Thermo Fisher Scientific stocks replacement and repair parts. When ordering, please describe parts as completely as possible, preferably using our part numbers. If practical, enclose a sample photo or drawing.

General Information






This manual provides the operation, maintenance, troubleshooting and other contents of Thermo Scientific™ Orion™ 8010cX Ammonia Analyzer. Read this manual completely before installing and operating this equipment. Users must strictly abide by relevant regulations to ensure the normal operation of the equipment. At the same time, relevant information can help users use the product correctly and obtain accurate analysis results.

Safety Measures

The instrument complies with the safety design rules formulated by international regulatory agencies, and all safety warnings marked on the instrument must be observed when using it, otherwise personal injury or even threat to life may be caused. In order to ensure that the protection provided by this instrument is not damaged, do not install or operate this instrument in any way outside the scope listed in this manual.

- Do not use the instrument in any environment not specified in this manual;
- Before maintenance and internal wiring of the instrument, the power supply must be disconnected;
- Do not operate the instrument with the door of electrical cabinet open;
- Wear protective equipments before changing reagents;
- Drinking water or beverages cannot be used instead of reagents to operate the instrument, which may damage the instrument.
- All safety labels are attached to the instrument. Refer to **Table 1** for details.

Table 1. Safety Precautions

Electric Shock and Fire Warning		<p>Be sure to cut off the power supply before installation, maintenance or repair.</p> <p>When conducting the connection of circuits, it is important to observe local or national laws and regulations.</p> <p>Under the condition of continuous operation, the operation unit must be grounded correctly.</p>
Warning		<p>A series of solutions containing various chemicals are used in the instrument. Some of these substances have potential hazards. Proper precautions must be taken when handling these chemicals or solutions.</p> <p>Contact and inhalation of chemicals are dangerous.</p> <p>You must pay attention to the following points:</p> <ul style="list-style-type: none"> • Wear protective clothing (laboratory clothing); • Wear protective goggles/face masks and protective gloves; • Work in a laboratory with exhaust devices; • Only glass or Teflon material is used when operating according to the steps in the User Manual; • After installation, ensure that all vent holes of used bottle are unblocked; • Ensure that you have obeyed applicable specifications for accident prevention; • Substances shall be disposed properly according to applicable local laws and regulations.
Grounding Warning		<p>When the product is marked with this symbol, it indicates the location of connecting the grounding wire in case of the connection of wires.</p>
Overheating		<p>When the product is marked with this symbol, do not touch it to prevent from being burned.</p>
Recycling Sign		<p>Electric power equipment with this sign cannot be abandoned in the European public waste system after August 12, 2005. According to European local and national regulations (EU Directive 2012/19/EU), European power equipment users must now return used or abandoned equipment to the equipment producers for disposal without paying any fees.</p>
Recycling		<p>For recycling, contact the equipment manufacturer, supplier or vendor to obtain information on how to return the discarded equipment, electronic accessories and all accessories for proper disposal.</p>
Note		<p>Indicates important information that requires special attention.</p>
Notice		<p>Indicates a situation which, if not avoided, may cause damage to the instrument or instruction for special use.</p>

Product Overview

Intended use

Orion™ 8010cX Ammonia Analyzer is a product developed by Thermo Fisher Scientific for on-line detection of ammonia nitrogen (ammonia nitrogen, ammonium radical and ammonia). Its application fields include the following aspects:

1. On-line detection of conventional wastewater: including on-line detection of pollution sources, inlet and outlet detection of sewage treatment facilities, etc.

2. On-line detection of surface water: including on-line detection of water sources, lakes, reservoirs, etc.

3. Industrial process on-line control: for sites where industrial processes need on-line detection.

4. On-line detection of drinking water: quality control of disinfection process and on-line detection of drinking water.

For applications not mentioned above, contact your local dealer or Thermo Fisher Scientific Inc.

Specifications

Table 2. Specifications of Orion 8010cX Ammonia Analyzer

Measuring performance	Range of measurement	Range 1: (0.02 - 2) mg/L; Range 2: (0.1 - 15) mg/L; Range 3: (0.5 - 30) mg/L; Range 4: (2 - 100) mg/L; Range 5: (30 - 500) mg/L; Five ranges in total
	Accuracy	Range 1: (0.02 - 2) mg/L: 3% ±0.04 mg/L of the reading Range 2: (0.1 - 15) mg/L: 3% ±0.1 mg/L of the reading Range 3: (0.5 - 30) mg/L: 3% ±0.2 mg/L of the reading Range 4: (2 - 100) mg/L: 3% ±0.3 mg/L of the reading Range 5: (30 - 500) mg/L: 5% ±4 mg/L of the reading
	Repeatability	Range 1: (0.02 - 2) mg/L: 3% or ±0.02 mg/L Range 2: (0.1 - 15) mg/L: 3% or ±0.05 mg/L Range 3: (0.5 - 30) mg/L: 3% or ±0.1 mg/L Range 4: (2 - 100) mg/L: 3% or ±0.3 mg/L Range 5: (30 - 500) mg/L: 3% or ±1 mg/L
	Limit of detection (LOD)	Range 1: (0.02 - 2) mg/L: 0.02 mg/L Range 2: (0.1 - 15) mg/L: 0.1 mg/L Range 3: (0.5 - 30) mg/L: 0.5 mg/L Range 4: (2 - 100) mg/L: 1 mg/L Range 5: (30 - 500) mg/L: 5 mg/L
	Resolution ration	0.001 mg/L for the reading < 100mg/L 0.01 mg/L for the reading ≥ 100mg/L
	Analysis cycle	Continuous and periodic measurement (start time can be set)
	Test method	Salicylic acid colorimetry

Table 2. Specifications of Orion 8010cX Ammonia Analyzer

Environment requirements	Operating temperature	5°C to 40°C* (41°F to 104°F)
	Maximum humidity	95% RH, no condensation
Sampling condition	Water sample flow	50 -1,000 mL/min
	Water sample pressure	0.2 - 5 bar (3 - 72.5 psi)
	Range of water sample temperature	0°C to 50°C (32°F to 122°F)
	Water sample ports	Flow cell inlet G1/2 female thread Flow cell G1/2 female thread
Water sample requirements after filtration by pre-filter	Total dissolved solids (TDS)	≤600 mg/L
	Total suspended solids (TSS)	<30 mg/L
	pH	4 - 9
	Chroma (Platinum-cobalt colorimetry)	<180°
Instrument installation	Housing protection class	IP65
	Case size (W x H x D)	450 mm x 737 mm x 322 mm (17.7 inches x 29 inches x 12.7 inches)
	Transportation weight	40 kg (88 lbs)
Electrical parameters	Requirements for power supply:	100 – 240 V AC, 100 W, 50/60 Hz
Data and control	Current output	two-circuit 0/4 - 20 mA outputs, maximum load of 900 Ω
	Dry contact output	2 dry contacts (relay output), 2 A @ 250 V AC
	Digital communication	MODBUS (Standard) Profibus (Optional)
Compliance with laws and regulations	Electrical safety	cTUVus, CE: EN/IEC 61010-1
	Electromagnetic compatibility	FCC (Class A), ICES, CE: EN/IEC 61326-1, RCM, KC
	Environmental compliance	CE-RoHS, REACH, China RoHS, Prop 65
Reagent consumption and waste	Reagent Consumption	Replace reagents every 100 days with 2 hour cycle time
	Chemical liquid waste quantity	<5L / month
Certification	CE, RCM, cTUVus, CPA and KC	
	    	

***Note:** In order to ensure the best performance of the instrument, it is recommended that the instrument shall be installed in the analysis room equipped with air condition within the temperature range of 20°C ± 5°C.

Instrument Size

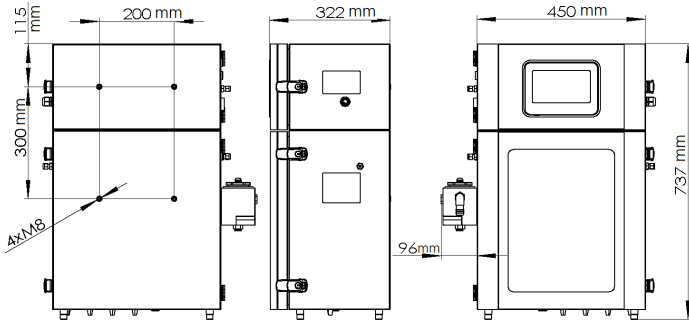


Figure 1. Size of Ammonia Analyzer (Unit: mm)

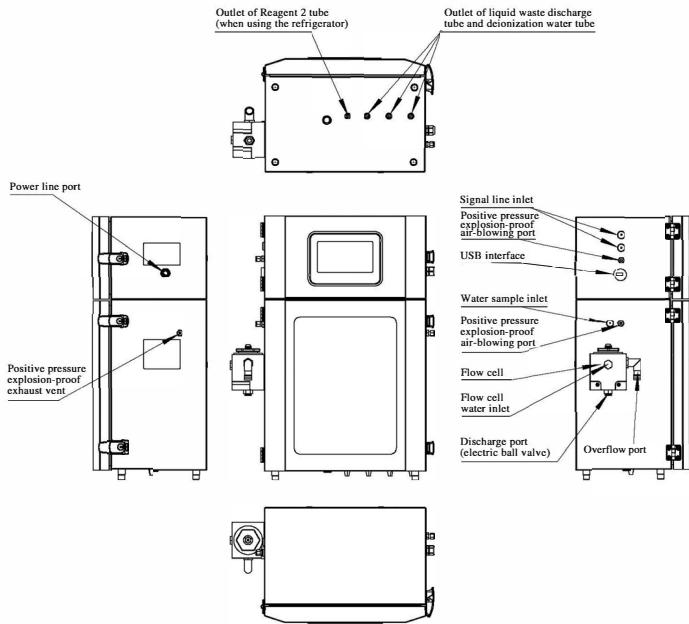


Figure 2. External interfaces of Ammonia Analyzer

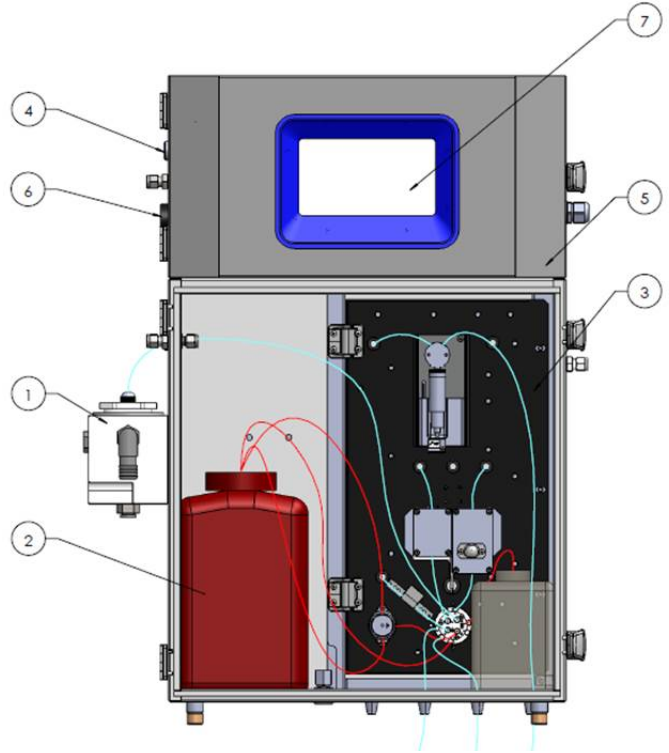


Figure 3. Schematic Diagram of Main Interactive Interface of Ammonia Analyzer

- | | |
|---|-----------------------|
| 1. Flow cell (optional) | 5. Instrument housing |
| 2. Standard solution bottle, Reagent bottle | 6. USB port |
| 3. Mounting panel base plate | 7. Touch screen |
| 4. Signal line interface | |

Note: If a refrigerator is provided on site, the reagent 2 must be stored in the refrigerator to prolong its service life.

Principles of Operation

Ammonia nitrogen refers to nitrogen existing in the form of free ammonia (NH_3) and ammonium ions (NH_4^+) in water. It is a very important indicator for detecting and controlling the environmental water quality of drinking water, surface water, municipal sewage, industrial sewage, etc. It is also an important water quality parameter for water quality detection.

Orion 8010cX Ammonia Analyzer is based on the Salicylate Colorimetric method. In this measurement technique: Ammonium reacts with salicylate and hypochlorite ions in the presence of alkaline condition and catalysts to generate a blue-green compound. The light absorbed by the blue complex at a specific wavelength is proportional to the ammonia nitrogen content. After calibration, the ammonia nitrogen concentration (unit: mg/L) in the unknown water sample can be detected.

Metal ions such as calcium, magnesium and iron in water, sulfides, available chlorine, aldehydes and ketones, pH, color, and turbidity could interfere with the measurement of ammonia.

When primary amine exists in water, the test result will be on the higher side. When water contains reducing substances, the test result will be on the lower side.

Orion 8010cX Ammonia Analyzer includes the following systems:

1. Electrical Control System
2. Water Sample Analysis System

The Electrical Control System includes the power supply module, measurement interface drive panel, and main control panel, and has the functions of instrument power-on self-test and fault alarm. Measurement data can be stored; the user can download data or upgrade the instrument program through U-disk. The test data can also be transmitted to external equipment through 0/4 - 20 mA current output or digital communication (MODBUS or Profibus), and the user can set the measurement time, measurement frequency, etc. according to the requirements of measurement.

The Water Sample Analysis System includes the units of water samples and reagents injection, color reaction, and measurement analysis. Water samples and reagents are injected by an injection pump to ensure a higher injection accuracy. The instrument has implemented an accurate temperature control on the color reaction process to ensure completion of the reaction.

Installation

Unpacking Inspection

Thermo Scientific Orion Ammonia Analyzers is assembled, tested and packaged with great care.

Report any obvious damage of shipping container to carrier and hold for inspection. The carrier (not Thermo Fisher Scientific) is responsible for any damage incurred during shipment. If any missing or damaged parts are found in these components, please contact Thermo Fisher or its representative office immediately.

1. Open the inner & outer packing, check the product and accessories according to the packing checklist.
2. The shipping box contains the analyzer, LVD Safety Manual, Quick Start Guide and User Manual USB drive.
3. Locate the dedicated external power switch or follow local regulations for power supply.
4. Place the analyzer at a suitable location until installation is complete.
5. Open the box and remove the accessories boxes from the top, See **Figure 4**

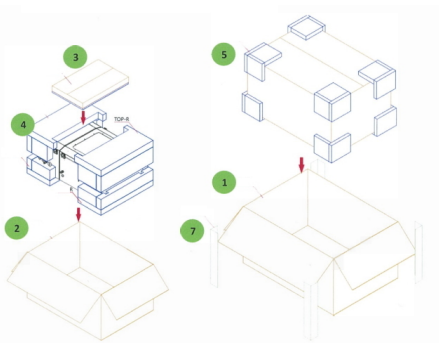


Figure 4. Unpacking the 8010cX Ammonia Analyzer

- | | |
|---------------------|------------------------------|
| 1. Outer Box | 5. EPE Corner Foam |
| 2. Inner Box | 6. EPE Bottom Foam |
| 3. Accessories Box | 7. Corrugated Protection Box |
| 4. EPE Packing Foam | |

Requirements for Instrument Installation

Basic Requirements for Instrument Installation

Instructions for instrument handling:



CAUTION: The equipment exceeding 40 lbs. should be lifted with the help of two persons or follow any heavy lifting policies of your employer has put in place.

- Safe lifting of the analyzer will require two people.
- The analyzer door should not be used during lifting as it will cause the seal and hinge to become loose.

Selection of installation position:

Refer to the **Specifications** for the temperature and relative humidity requirements of the installation environment.

It is suggested to install the instrument in an instrument housing, a protective case, or an analysis room. The temperature shall be controlled within $20 \pm 10^{\circ}\text{C}$ and the maximum humidity without condensation is less than 95%.

Orion 8010cX Ammonia Analyzer has IP65 protection grade and can be installed outdoors. However, the installation position of the instrument must be dry and avoid direct sunlight, and the temperature variation between day and night shall not be higher than $10^{\circ}\text{C} / 24\text{h}$.

Select the location as close as possible to the water sample source to install the instrument, which can reduce the analysis delay as much as possible.

The installation of the instrument shall comply with the following requirements:

The instrument can be hung on the wall through the mounting bracket, and can also be installed on a worktop or a vertical cabinet for operation. No matter which installation method is adopted, it is required to fasten the instrument with screws. After being installed, the instrument must be secure to avoid movement during operation.

Ensure that the selected wall on which the instrument is to be installed can support at least 4 times the weight of the instrument (about 40KG);

Enough space should be reserved on the right side of the instrument to facilitate wiring and placing the liquid waste tank or deionized water tank.

Enough space should also be reserved on the left side of the instrument to facilitate door opening, tube laying and wiring.

The instrument should be installed at a position with suitable height. It is suggested that the screen shall be level with the operator's line of sight.

Remaining level is required for the installation of the instrument, and it is recommended to use a spirit level for leveling.

For the schematic diagram of the instrument installation, refer to **Figure 5**.

Note: During installation and operation, when the instrument door and internal fluid mounting panel are open, there is risk that the analyzer may fall on its side.

Note: During the installation of the instrument, especially when installing external cables, do not discard the rubber sealing covers on the side of the instrument. External cables need to pass through these rubber sealing covers to maintain the integrity of the IP65 enclosure. Schematic Diagram of on-site instrument installation.

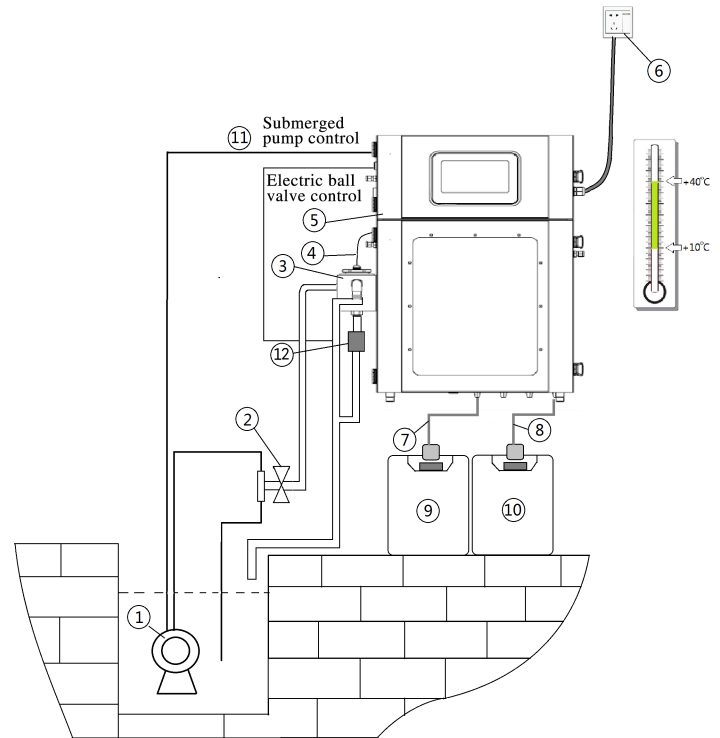


Figure 5. Schematic Diagram of On-site Installation of Ammonia Analyzer

- | | |
|---|--|
| 1. Submersible pump (Equipped by user) | 7. Liquid waste tubes (2 in total) |
| 2. Manually-operated valve (Equipped by user) | 8. Deionized water tube (1 in total) |
| 3. Flow cell (Optional for user) | 9. Liquid waste tanks (2 in total, Equipped by user) |
| 4. Water sample injection tube | 10. Deionized water tank (1, Equipped by user) |
| 5. Ammonia Analyzer | 11. Submersible pump control (Equipped by user) |
| 6. Power supply socket (Equipped by user) | 12. Electric ball valve (Equipped by user) |

Note: This instrument needs to be equipped with two liquid waste tanks, one containing liquid chemical wastes and the other containing harmless cleaning liquid wastes. The corresponding tubes should not be interchanged.

Note: Deionized water must be a clear, colorless, odorless and tasteless liquid, (it should not contain ammonia) and its resistivity is greater than $2 \text{ M}\Omega \cdot \text{cm}$ (megohm \cdot cm).

Analyzer Mounting Options

Wall Mounting method

Ensure that the firmware on the wall surface has enough load capacity (at least 4 times the weight of the instrument is required). The screws on the wall must be strictly selected and should be suitable for the characteristics of the wall. If the instrument is damaged due to improper installation, Thermo Fisher will not assume any responsibility.

For wall mounting, it is recommended to use the wall-mounting bracket assembly provided in the package. At first, fix the wall hanging board in the assembly to the wall with expansion screws, at least 4 expansion screws are needed, and it is recommended to use more than 6 expansion screws. Then, take out two hangers from the assembly and fix them at the corresponding positions on the back of the ammonia nitrogen detector with M8 screws and gaskets. Finally, the instrument is secured on already-fixed wall mounting bracket on the wall surface through a hanging rack already-installed on back of the instrument. During the installation process, use a level ruler to ensure that the wall mounting bracket and the ammonia nitrogen detector are installed to the required level.

Refer to the following **Figure 6** on page 09

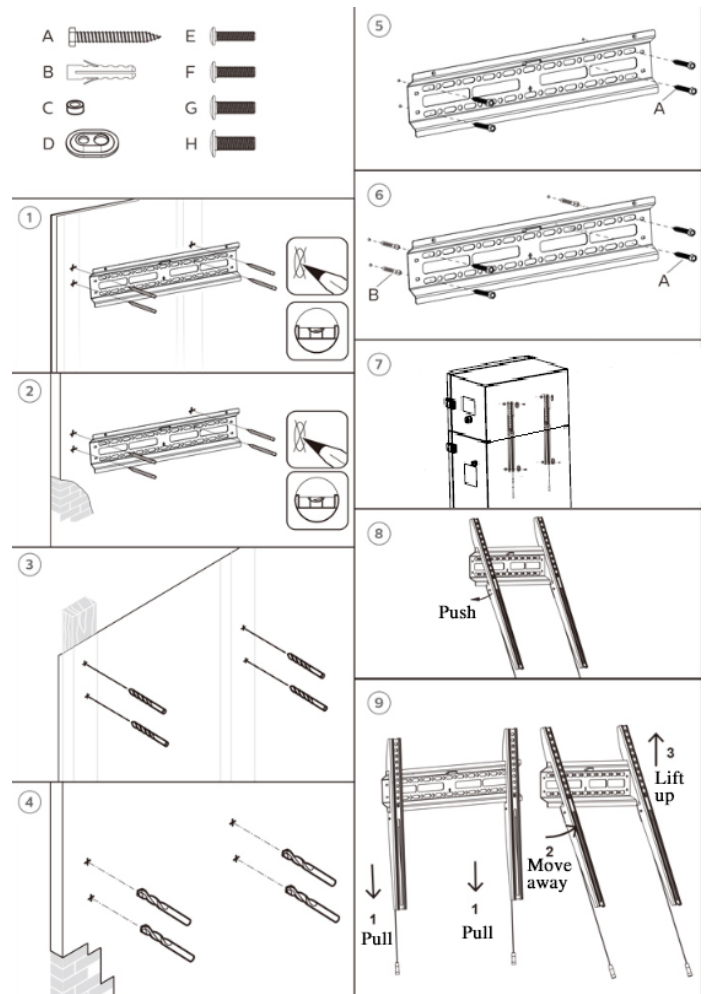


Figure 6. Schematic Diagram of Wall Mounted Ammonia Analyzer

Flow Cell (Flow cell components are optional)

The flow cell is located in the lower left side of the instrument for water sample collection and filtration.

The components of the flow cells are shown in **Figure 7**.

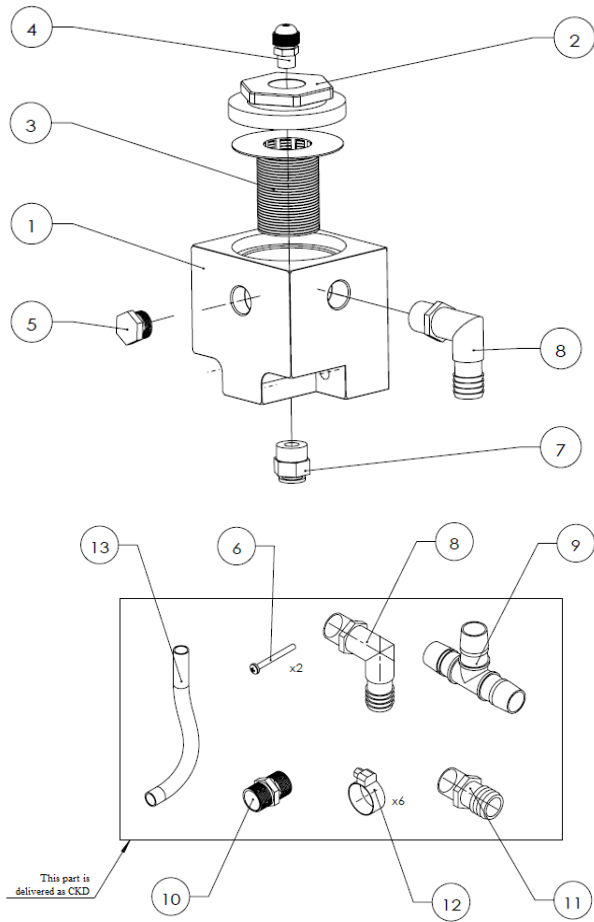


Figure 7. Schematic Diagram of Flow Cell Components

Item No.	Name	Quantity	Specification
1	Flow cell body	1	
2	Flow cell upper cover	1	

Item No.	Name	Quantity	Specification
3	Flow cell filter screen	1	Stainless steel mine sieve, 200 microns
4	Upper cover connector	1	
5	Flow cell plug	1	G1/2 external thread, plastic
6	Pan head screw	2	M4-40, stainless steel
7	Quick connector	1	G1/2 external thread to gas tubes of 10 mm outer diameter, stainless steel
8	Elbow fitting	2	G1/2 external thread to 19.5 mm elbow fitting, plastic
9	T-shape fitting	1	T-shape equal diameter tee fitting, 20 mm, plastic
10	Double threaded straight fitting	1	G1/2 to G1/2 male double threaded straight fitting, stainless steel
11	Straight extended fitting	1	G1/2 external thread to 20 mm straight extended fitting, plastic
12	Hose clamp	6	Diameter: 14-27 mm, stainless steel
13	Hose	2m	Steel wire reinforced hose, inner diameter: 19 mm
14	PTFE tape	several	

Note: PTFE tape shall be applied around the thread to ensure a seal is formed around the connection.

The entire flow cell is fixed on the side wall of the Ammonia Analyzer with two M4 x 40 mm screws, as shown in **Figure 8**.

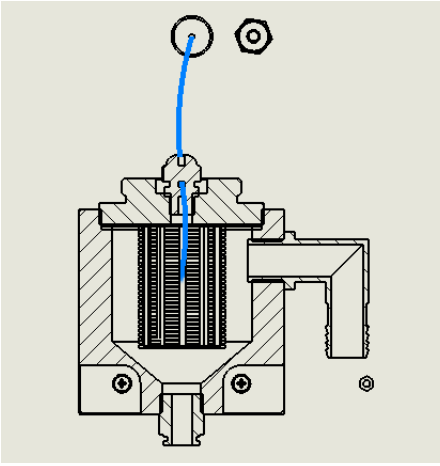


Figure 8. Schematic Diagram of Flow Cell Installation Position

NOTE

- The installation position of the flow cell must be higher than the water level of the sampling cell.
- The sampling tube shall be inserted into the flow cell and lower than the overflow port.
- When the flow cell is working, the filter screen shall be installed inside. Otherwise, the service life of the instrument may be shortened.
- The filter screen needs to be cleaned regularly to prevent the filter screen from being blocked to ensure the water samples enter the Ammonia Analyzer for detection.
- It is suggested to install a ball valve at the water inlet end to control the flow rate of the water sample entering the flow cell.

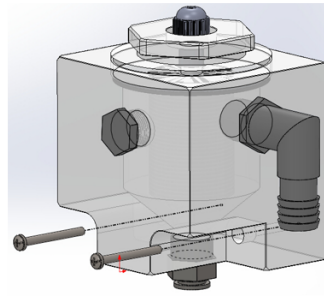
The design of the flow cell is suitable for two field application scenarios:

- option one with a proportional sampler
- option two without a proportional sampler

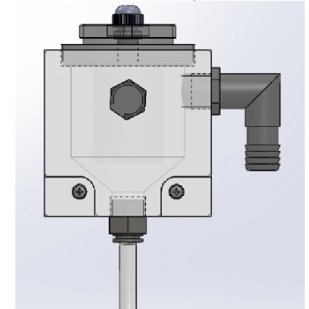
1.External control of water sample incoming and outgoing (e.g. proportional sampler).

Description of flow cell installation steps:

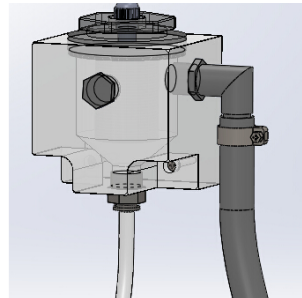
- Use the 4 X 40 screw in the accessories to lock the Flow Cell to the side of the case.
- Connect the hose from the proportional sampler to the quick connector at the bottom of the Flow Cell. The outer diameter of the hose is Ø10.



c. Insert the steel wire reinforced hose into the elbow fitting on the side of the Flow Cell and lock it with a clamp. The inner diameter of the hose is Ø19.



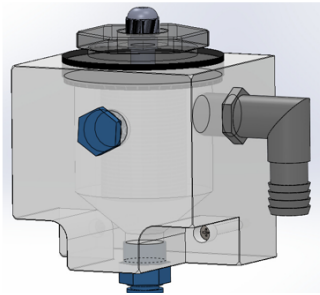
d. Unscrew the fitting on the top of the Flow Cell, insert the PTFE water inlet tube of the Ammonia analyzer, and tighten to prevent the water inlet tube from moving.



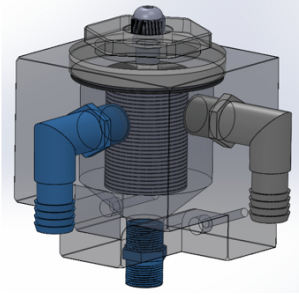
2. Water sample incoming and outgoing is controlled by the Ammonia Analyzer

Description of flow cell installation steps: (The electric ball valve shall be purchased by the user):

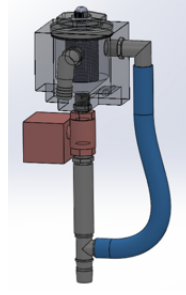
- After unpacking, remove the plug on the front of the Flow Cell and the quick connector on the bottom.
- Wrap PTFE tape around the G1/2 to G1/2 externally threaded stainless steel double threaded straight fitting, and screw it into the threaded hole in the bottom of the Flow Cell. Wrap PTFE tape around the G1/2 male threaded plastic elbow fitting, and screw it into the threaded hole on the front of the Flow Cell.



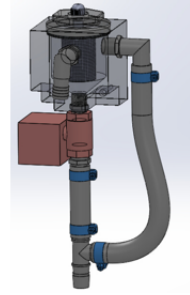
c. Wrap PTFE tape around the threads of the G1/2 stainless steel fitting on the bottom of the Flow Cell and screw it into the electric ball valve. The specific settings of the electric ball valve are described later.



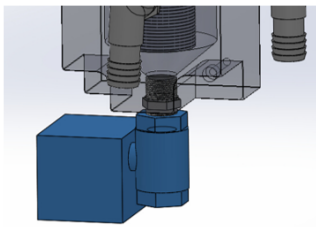
d. Wrap PTFE tape around the external threads of the G1/2 to 20 elbow fitting and screw it into the internal threads on the bottom of the electric ball valve.



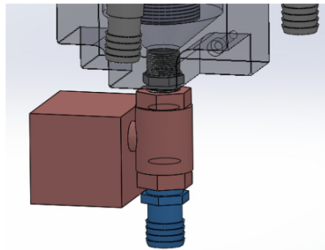
k. Connect the drain tube to the T-type equal-diameter tee fitting. The outlet tube also uses the steel wire reinforced hose. The hose is inserted as deep as possible, and then it is locked with a hose clamp to prevent water leakage.



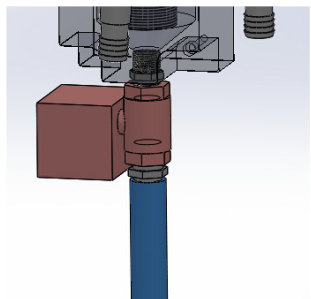
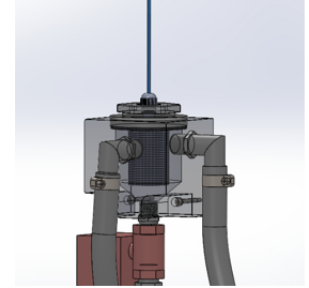
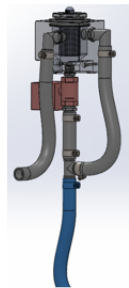
l. Unscrew the flow cell plug on the top of the Flow Cell, insert the PTFE inlet tube of Ammonia analyzer, and tighten to prevent the inlet tube from moving.



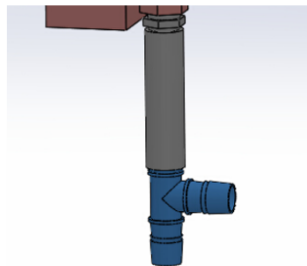
e. Cut a section of steel wire reinforced hose of about 100 mm and insert it into the extended fitting at the bottom of the electric ball valve and insert it as deep as possible.



f. Insert a T-type equal-diameter tee fitting at the other end of the steel wire reinforced hose and insert it as deep as possible.



g. Insert the both ends of a section of steel wire reinforced hose into the elbow fitting on the side of the Flow Cell and the T-type tee fitting on the bottom as shown below, and insert it as deep as possible.



h. Place the four hose clamps at the connection of the T-fitting box steel wire reinforced hose and tighten to prevent water leakage.

Electrical Connection

Electrical Basic System

The basic electrical system mainly includes the following components:

- Measurement interface drive panel (MCB)
- Main control panel (SBC)
- Power supply wiring

Measurement Interface Drive Panel

The measurement interface drive panel is installed inside the upper cabinet. It mainly performs the driving and communication functions of various electronic components required for ammonia nitrogen applications. It is connected to the main control panel through J22 and transmits the status of each component to the main panel.

In addition, the measurement interface drive panel also includes a lot of external interfaces, including (2) 0/4 - 20 mA output interfaces, (2) digital input interfaces, (2) relay control interfaces and (1) 0-5 V analog input interface, and (1) 4 - 20 mA analog input. Refer to **Figure 9** for the main interfaces.

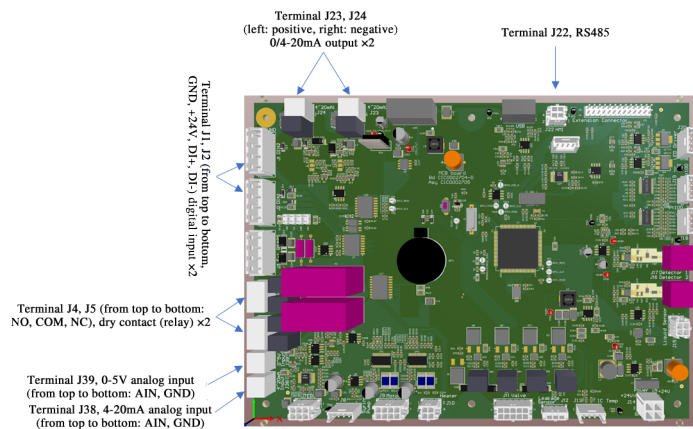


Figure 9. Diagram of Main Interface of Measurement Interface Drive Panel

Description of electric ball valve setting:

The electric ball valve is a stainless steel mini-type electric two-way ball valve with double internal threads DN15 and 24 V and is installed at the water inlet of the flow cell.

For the installation of the electric ball valve, refer to **Figure 10**.

CRO3 (three-wire control mode) wiring diagram

Voltage: DC3-6V/12V/ A/DC9-24V, AC22

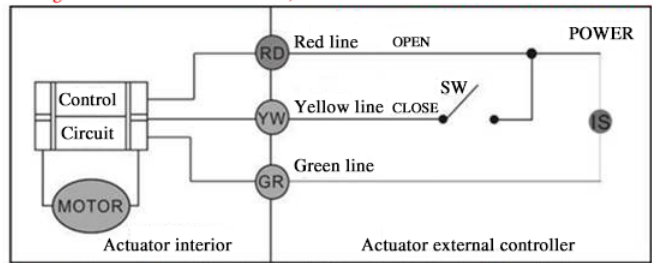


Figure 10. Diagram of Electric Ball Valve Installation

1. SW is closed and the valve is open. After arriving in place, the internal power is automatically turned off and kept in fully open (straight through) state;

2. SW is open and the valve is closed. After arriving in place, the internal power is automatically turned off and kept in fully open (straight through) state;

The cable marked “24 V” and “GND” in the above figure gets power from J2 on the instrument internal measurement interface drive panel. The cable marked “COM” and “NO” is connected to relay #2 (COM and NO of J4). Externally connected water pump is controlled via relay #1 (J5), as shown in **Figure 9**.

For the actions settings before running

(analytical procedure >> pre-running), refer to **Table 3**:

Table 3. Actions Settings Before Running

No.	Part	Time (min)	Action
1	Relay 1 (pump)	0	On (relay closed, pump On)
2	Relay 2 (ball valve)	0	On (relay closed, valve open)
3	Relay 2 (ball valve)	2	Off (relay open, valve closed)
4	Relay 1 (pump)	4	Off (relay open, pump Off)

Adjust the manually-operated valve at the water inlet to control the inlet flow at a flow rate that just fills the flow cell up in 1 minute. Start the automatic measurement of the instrument.

Main Control Panel

The components of main control panel are installed on the rear of the upper cabinet door panel, which is convenient for user operation. It consists of a core board, an expansion board and a display screen. The main control panel supports touch control. The components of main control panel are connected to the measurement interface drive panel via RS485 (J8) cable.

Relevant wiring of the main control panel is shown in the following figure:

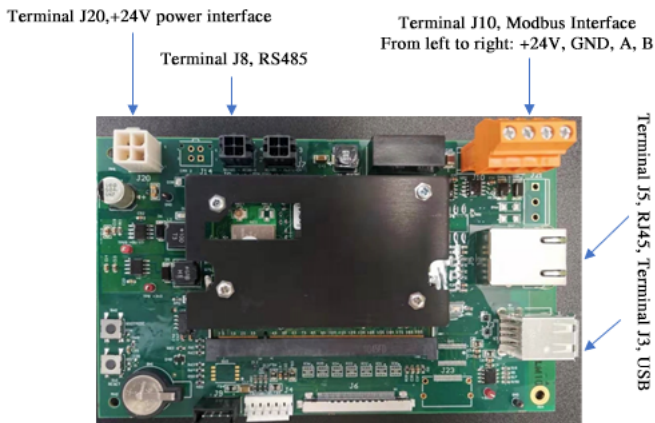


Figure 11. Components of Main control panel

Safety Wiring

- Only trained or authorized technicians are allowed to carry out electrical wiring and maintenance. Proper operation is required to avoid ESD (electrostatic discharge), otherwise the electronic components inside the circuit board will be damaged due to electrostatic breakdown. Be careful, measures shall be taken, and ESD shall be grounded.
- It is suggested that technicians shall release static electricity on their body before touching any electronic components (such as the PCB board and its components). For example, by touching the instrument housing, metal conduit, and water tube with hands.

Notices before Wiring

- Make sure the power cord is not powered on before connecting the power supply to the instrument.
- Cut off the power supply previously connected to the relay;

- Lead the live wire, neutral wire and ground wire to the power supply terminal in the instrument electrical box, and pay attention to the position of the fuse;
- Insert the wire into the corresponding wiring terminal and tighten the screw;
- All connections must conform to local safety standards.

Notices during Wiring

- Make sure that the instrument is not powered on when conducting wiring operations;
- Strip off a 6 mm insulation layer of each cable;
- Insert the metal wire after stripping off the insulation layer into the wiring terminal, and tighten the screw. The maximum torque for tightening the screw shall not exceed 0.6 nm, meanwhile the maximum pulling force shall not exceed 20 N;
- The isolation design is applied to the external RS485 and 0/4 - 20 mA interfaces;
- Maximum switching capacity of relay contacts: 250 V / 2 A (resistive load).



WARNING: The instrument is not equipped with a power switch, so the power switch with the functions similar to that of a breaker should comply with local safety standards and must be prepared before final installation. The circuit breaker must be as close to the instrument as possible and convenient to be controlled by the operator. When the instrument is powered off, there must be a clear and explicit indication. All conductors need to have a temperature resistance of at least 75°C. Do not power on the instrument until all preparation work (including reagent installation, water sample access, etc. is completed).

Connection of Power Cord

- The instrument is equipped with three sets of power wiring terminals in the electrical box (see **Figure 12** and **Table 4**).
- It is strongly suggested that the user shall install an external power switch or a circuit breaker box (with leakage protection) for the instrument to facilitate the operator to control. In addition, the instrument must be powered off during maintenance operations such as reagent replacement.
- The instrument power cord is designed to be a hard connection and is led in through the threading conduit on the right side of the case (see **Figure 13**).
- The power cord shall be a certified 3-core wire, with a minimum of 0.75 mm² / 18 AWG, and the temperature resistance shall not be less than 75°C. The instrument must have a good power ground wire.

Table 4. Wiring Mode of AC Power Supply

Wire Terminals	Live wire (L)	Ground wire (G)	Neutral line (N)
Colors of Power Cords	Brown	Yellow green	Blue

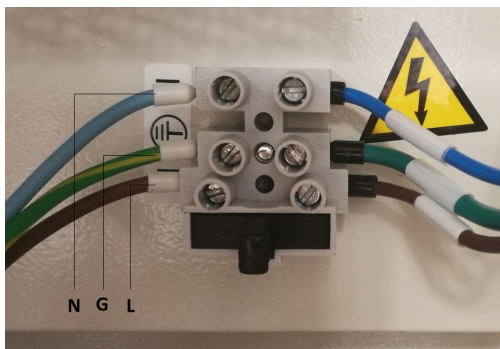


Figure 12. Wiring of AC Power Supply

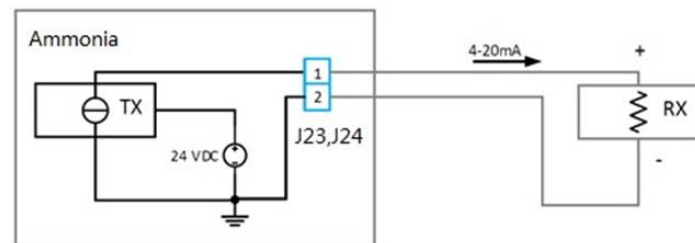


Figure 15. Schematic Diagram of 0/4 - 20mA Current Loop Link



Figure 13. Schematic Diagram of Power Cord Access Port

Communication Connection

0/4 - 20 mA analog signal wiring

The instrument provides two-circuit 4 - 20 mA active analog signal outputs through the power control board, which can drive a load of up to 900 Ω. J23 and J24 are 4 - 20 mA analog signal wiring terminals (see **Figure 9**), and **Table 5** provides the description of corresponding functions. Refer to **Figure 15** for the schematic diagram of 0/4 - 20 mA current loop link. Note that since the instrument 4 - 20 mA itself is active, it shall not be treated as passive and connected with an additional power supply, otherwise the 4 - 20 mA output module will be burnt.

The communication connection can be connected out through the signal line port on one side of the equipment. The recommended port wiring diagram is as follows:

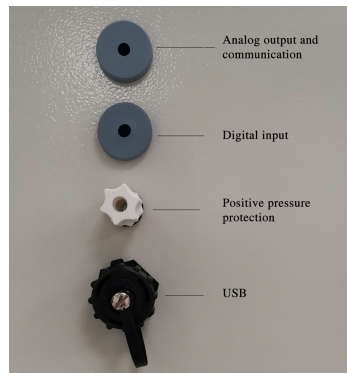


Figure 14. Schematic Diagram of Signal Wiring

Table 5. J23 and J24 Wiring Terminals

Connector	Terminal No.	Name	Description
J23	1	AO+	2# analog output+ (max. load of 900 ohm)
	2	AO-	2# analog output-
J24	1	AO+	1# analog output+ (max. load of 900 ohm)
	2	AO-	1# analog output-

Alarm Signal Wiring

The instrument provides two relays, J4 and J5, without voltage contacts through the measurement interface drive panel (see **Figure 9**). Two contacts: normally open (NO), normally closed (NC) and common terminal (COM). The maximum rated capacity of relay contacts is 240 V, 2 A. The maximum acceptable cable size for the wiring terminals is 14AWG. **Table 6** describes J4 and J5 wiring terminals and corresponding functions.

Table 6. J4 and J5 Wiring Terminals

Connector	Terminal No.	Name	Description
J24	1	NC	2# Relay NC Contact
	2	COM	2# Relay COM
	3	NO	2# Relay NO Contact
J25	1	NC	1# Relay NC Contact
	2	COM	1# Relay COM
	3	NO	1# Relay NO Contact

Digital Signal Input Wiring

Two digital input interfaces on the measurement interface drive board are used for the external trigger control. Pin 1 and pin 2 of J1 and J2 are inputs. Either external power input or internal power of the instrument can be used. If external power input is used, the external power supply shall be 5~24 V DC. If the internal power of the instrument is used, pin 3 and pin 4 of J1 and J2 provide a 24 V DC power supply. Refer to **Figure 16** for specific digital power access. Refer to **Table 7** for digital signal input wiring.

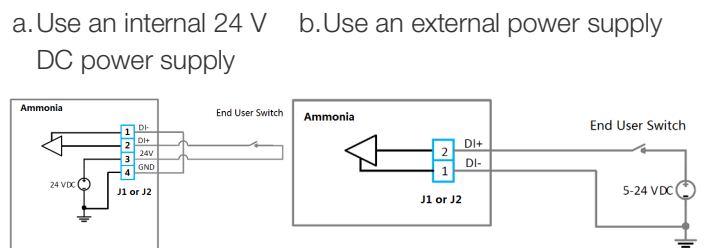


Figure 16. Digital Power Access

Table 7. J1-J2 Digital Signal Input Wiring

Connector	Terminal No.	Name	Description
J1	1	DI-	2# input digital signal-
	2	DI+	2# input digital signal+
	3	24 V DC	24 V DC+
	4	GND	24 V DC-
J2	1	DI-	1# input digital signal-
	2	DI+	1# input digital signal+
	3	24 V DC	24 V DC+
	4	GND	24 V DC-

MODBUS (RS485) communication output interface

MODBUS (RS485) communication output interface is located on the upper side of the main control panel, and its terminal connection diagram is as follows:

Terminal J10, Modbus interface, from left to right: +24V, GND, A, B



Figure 17. Schematic Diagram of RS485 Communication Wiring Terminal

The instrument provides a MODBUS (RS485) communication output interface through the main control panel (The default baud rate is 19200). Refer to **Figure 18** and **Table 8** for signal wiring.

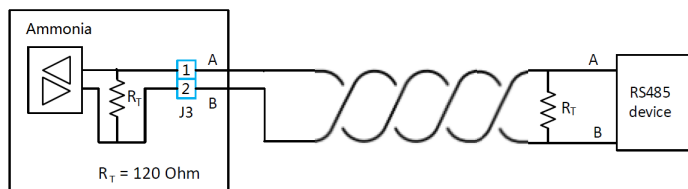


Figure 18. Schematic Diagram of RS485 Communication Signal Wiring

Table 8. RS485 Communication Signal Output Interface

Connector	Terminal No.	Name	Description
J10	1	A	RS485-B
	2	B	RS485-A
	3	GND	Ground
	4	+24 V	Power +24 V

The RS485 interface can provide the electrostatic discharge (ESD) protection stipulated by the International Electro technical Commission (IEC), but has no lightning protection design. When using the twisted pair cables with impedance matching with the RS485 termination resistor (typically 120 ohms), the interface typically has a maximum bus length of 1,200 m. The actual maximum bus length depends on the signal rate, cable characteristics and environmental conditions. For example, RS485 communication code requires the twisted pair connection. If parallel lines are used, the maximum bus length will be shortened accordingly. Recommended RS485 cables include:

- a) 6453 Alpha wire;
- b) 3106A Belden.

Stress relief treatment for external wiring

All external wiring shall receive stress release treatment near the rubber sealing cover in the cabinet, otherwise the cables will be pulled, which would cause the damage of the wiring terminals on the circuit board.

Liquid Leakage Alarm

The liquid leakage alarm sensor should be installed at the bottom of the instrument. Once liquid leakage is detected, the instrument would immediately give an alarm and stop operation to prevent accidental leakage from causing corrosion damage to the instrument or causing safety problems.

The liquid leakage sensor is connected to the control circuit of the entire instrument through a connector. When the leakage liquid level exceeds the warning position, the liquid leakage alarm sensor would give out an alarm signal. And for the sake of safety, the instrument would automatically stop measuring. Only when the error is corrected and the liquid leakage sensor recovers to be dry again can the measurement operation be restarted. Dispose liquid and waste after wiping properly according to local regulations.

System Startup

The Ammonia analyzer uses reagents, calibration solutions and de-ionized water during its standard operation.

Before completing the preparation of reagent, water sample, standard solution, deep cleaning solution (optional) and deionized water access, etc., do not turn on the power the instrument.

Reagent Preparation



DANGER: Exposure to and inhalation of chemicals are hazardous. Only trained and qualified personnel can perform the work described in this section of the User Manual.



WARNING: Exposure to and inhalation of chemicals are hazardous. It is recommended that to minimize chemical exposure and ensure measurement performance, reagents and solutions can be ordered from Thermo Fisher Scientific.

Thermo Fisher has provided reagents packet for customers to purchase. The reagents packet contains four reagent bottles, which are marked with Ammonia Nitrogen reagent 1, Ammonia Nitrogen reagent 2 Part A, Ammonia Nitrogen reagent 2 Part B, and Ammonia Nitrogen reagent 3, respectively. In which, reagent 1 and reagent 3 can be directly installed and connected.

Reagent 2 is prepared from reagent 2 Part A and reagent 2 Part B. As shown in **Figure 19**, open the bottles of reagent 2 Part B and reagent 2 Part A, pour all the solid powder in reagent 2 Part B into the bottle of reagent 2 Part A, cover the bottle cap, after being moderately shaken, it shall be placed for more than half an hour, then open the bottle cap, and when no undissolved powder is observed to deposit on the bottom of the bottle, continue the installation and connection.



Figure 19. Ammonia Nitrogen Reagent 2 Part A and Part B Bottles

For safety purposes, observe the following rules when handling reagents:

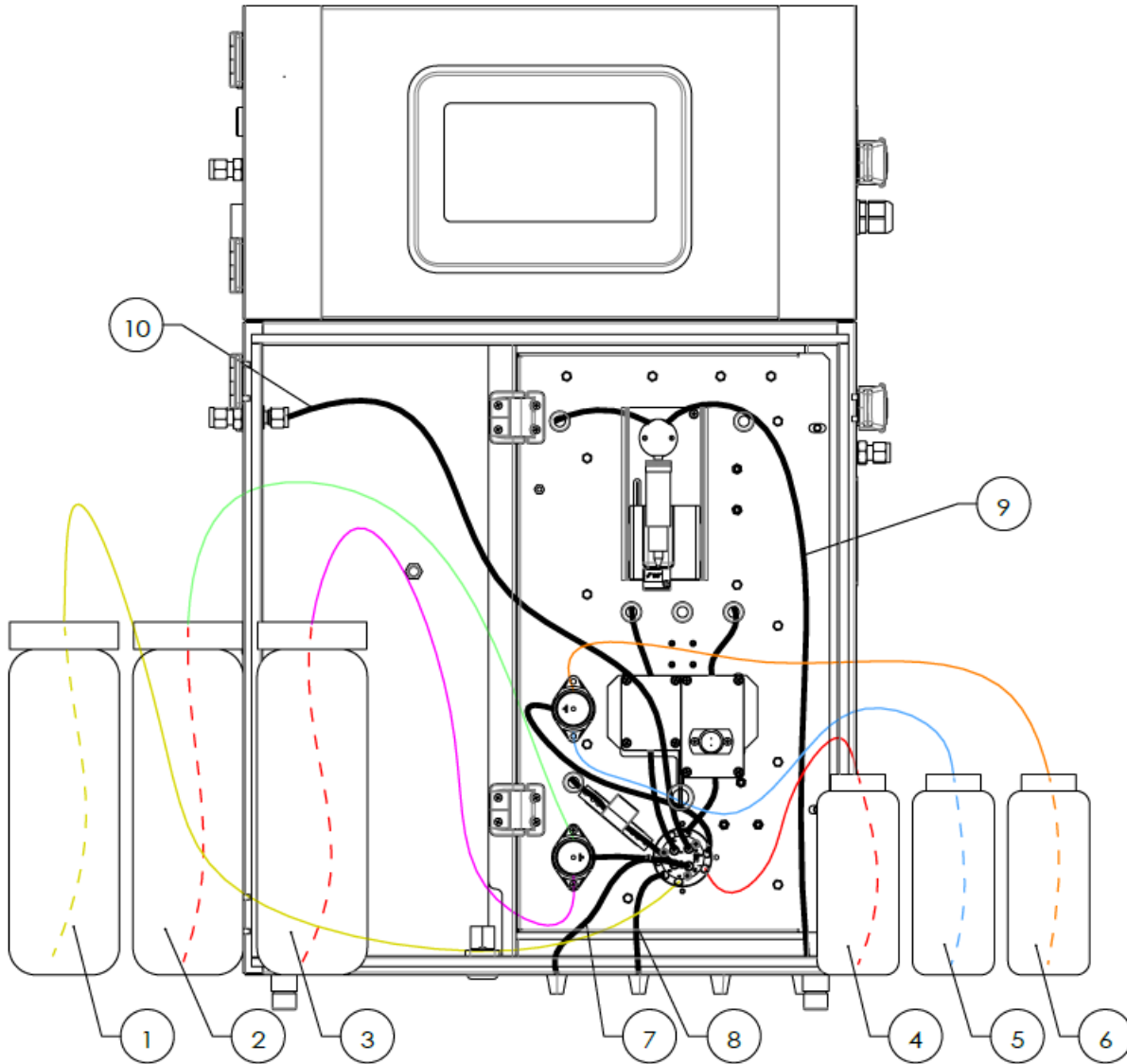
- Wear protective clothing (or experimental work clothes) provided together with the instrument.
- Wear safety goggles / face mask or protective gloves.
- Exhaust fans must be installed at the work site.
- In this chapter, only glass or high-density polyethylene and other materials with good resistance to acids can be used in the whole process of preparation.
- **Ensure that all bottles are ventilated after installation.**
- Ensure compliance with applicable local accident prevention laws and regulations.
- Properly dispose of all chemicals and obey applicable local laws and regulations.

Tubing Connections

The instrument is equipped with a total of 3 reagents (Reagent 1, Reagent 2 Part A, Reagent 2 Part B, and Reagent 3), and at 5 standard solutions and deep cleaning solution. Customers are suggested to purchase them directly from Thermo Fisher except for deep cleaning solution.

For the tubing connection of specific reagents, standard solution and deep cleaning solution, refer **Figure 20**.

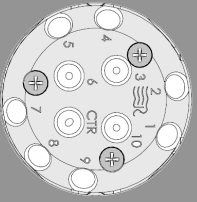
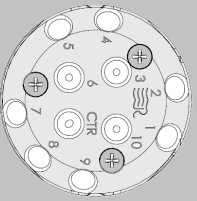
Refer to **Table 9** for the schematic diagram of port position of electronic rotary valve inside the instrument and its tubing connection information.



- | | | | |
|---|---|----|--|
| 1 | Reagent bottle 1 | 6 | Standard Solution |
| 2 | Reagent bottle 3 | 7 | Cleaning waste liquid tube (1 in total) |
| 3 | Reagent bottle 2 | 8 | Chemical waste liquid tube (1 in total) |
| 4 | Deep cleaning solution bottle
(provided by customer) | 9 | Deionized water tube (1 in total) |
| 5 | Validation solution | 10 | Tubing of tested water sample (1 in total) |

Figure 20. Schematic Diagram of tubing Connections of Reagent, Standard Solution and Deep Cleaning Solution

Table 9. Schematic Diagram of Electronic Rotary Valve Port and Its Port Connection

ERV ports and connections	Port No.	Reagent Name	Remark
	Port 1	Deep cleaning solution	To deep cleaning solution bottle
	Port 2	Standard and validation solution common port	3-port valve common port
	Port 3	Tested water sample port	To on-site tested water sample
	Port 4	Measuring cell outlet	To measuring cell
	Port 5	Venthole	To atmosphere
	Port 6	Reaction cell outlet	To reaction cell
	Port 7	Chemical liquid waste port	To reaction liquid waste tank. Contain harmful substances. It shall be treated by a professional company before discharge.
	Port 8	Cleaning liquid waste port	To cleaning solution liquid waste tank, there is no harmful substance. It shall be simply treated by the user before discharge.
	Port 9	Reagent 1	To reagent bottle 1
	Port 10	Three-way valve common port	To three-way valve common port to reagent 2 and reagent 3
	Intermediate port (CTR)	Common port	To the buffer ring

Note:

- Only trained and qualified personnel can perform reagent related operation.
- Different sample injection tubing must be correctly inserted into the corresponding reagent bottles and standard solution bottles.
- Insert the sample injection tube into the bottom of the bottle as much as possible.
- After installation, ensure that all vent holes of bottles are unblocked.
- The length of tubes R1, R2 and R3 should be controlled within a certain range, and R1 is suggested not to exceed 1.0 m.

Installation of Reagent Bottle and Standard Solution Bottle

For the installation of reagent bottle and standard solution bottle, it is recommended to operate in the mode shown in **Figure 21**.

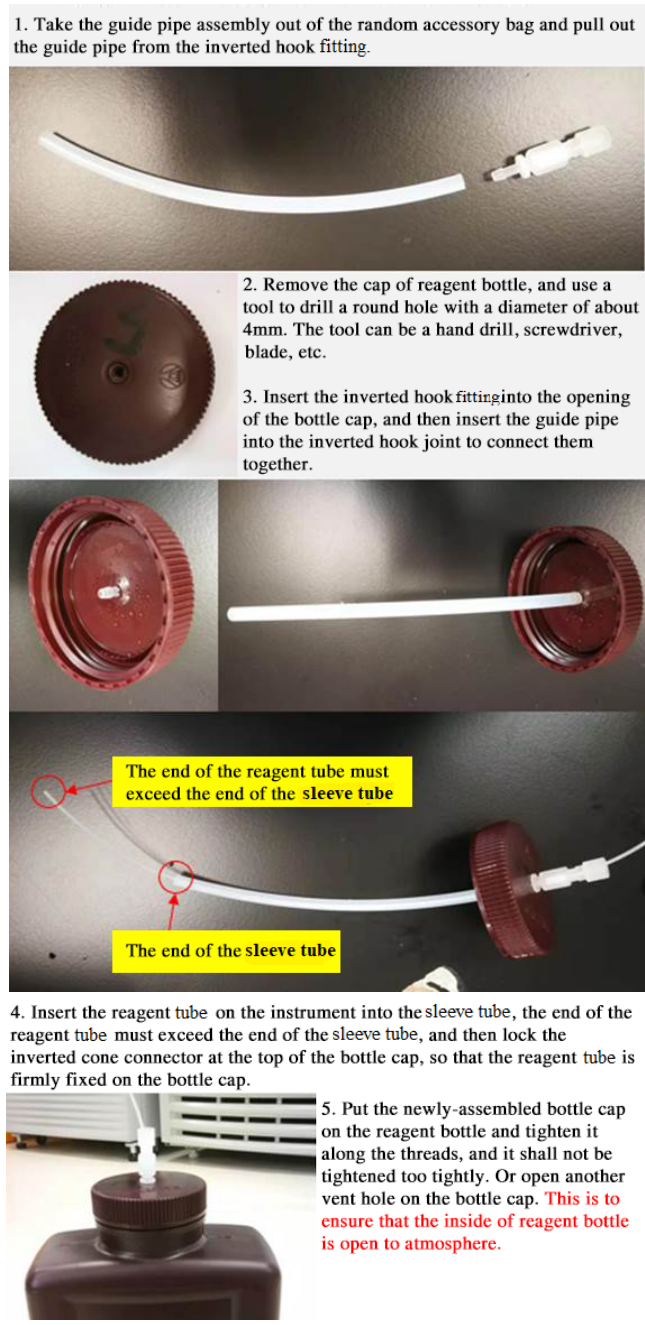


Figure 21. Recommended installation method of Reagent Bottle

Installation of Tested Water Sample

After the tested water sample tube is led out from the rubber stopper at the lower left side of the instrument, it is inserted into the top inlet of the flow cell. Refer to **Flow Cell (Flow cell components are optional)** for specific operations.

In the flow cell (or similar equipment), the water sample needs to be retained. It is recommended that the water sample shall be fully discharged before the end of measurement to ensure that the equipment needs special operations such as range switching.

Installation of Liquid Waste Tank and Deionized Water Tank

In total, the instrument has two liquid waste tubes for discharge. One is connected to the chemical liquid waste tank and the other is connected to the cleaning liquid waste tank. It is also required that the liquid waste tube can be correctly connected to the lid of the liquid waste tank to prevent liquid waste from flowing out and causing safety problems.

Both the deionized water inlet and two liquid waste discharge ports are at the bottom of the instrument, so both the deionized water tank and liquid waste tank need to be placed below the instrument.

Main steps of liquid waste tubes installation:

- a. Two liquid waste tubes pass through two rubber sealing covers at the bottom of the instrument cabinet;
- b. Adjust and cut the liquid waste tube outside the instrument to a suitable length (according to the specific position of the liquid waste tank), fix it on the lid of the liquid waste tank and extend it into the liquid waste tank.

Note:

- Only trained and qualified personnel should perform liquid waste related operations;
- The user shall regularly treat the chemical liquid waste tank as required and add deionized water as required (it is recommended that the maximum interval should not exceed one month).
- The liquid waste tubes should not be immersed below the level of liquid waste to avoid the suck-back of liquid wastes.

- The liquid waste tube must descend directly down from the instrument to the liquid waste tank without bending, twisting or turning in the middle, otherwise it will lead to difficulties in overflow of liquid wastes, which will affect the functions of the instrument.
- Hazardous chemical liquid waste tubes and cleaning liquid waste tubes must be inserted into the hazardous chemical liquid waste tank and non-hazardous cleaning liquid waste tank respectively, and shall not be inserted incorrectly;
- The liquid waste tank must be clearly marked. Disposal of liquid waste should be managed in accordance with local laws and regulations.

Instrument Startup

After the installation of reagent, standard solution and water sample is completed, power on the instrument, and the instrument enters the main interface. Users can choose to view the status of the instrument, set the parameters of the instrument, enter the maintenance mode, or conduct analysis and calibration.

If the automatic initialization option of the system has been set as “ON”, the instrument will be initialized automatically after starting up. Please wait patiently for the automatic completion of the initialization step.

It is recommended that the user shall set the automatic initialization option as “ON”. Such setting ensures that after the power-off and restart of the instrument, the automatic initialization operation is performed before automatic measurement, so as to avoid direct measurement from damaging the instrument.

Priming

Before the subsequent formal analysis, it is required to prime the flow path. The main purpose of priming is to expel the air from the reagent and water sample tubing, while filling the tubes with fresh water sample and reagent to ensure the normal subsequent analysis.

The user can select tubing solutions to prime such as: deionized water, water sample, standard solution, reagent 1, reagent 2, reagent 3 and all. It is recommended that deionized water shall be 5 mL, and other solutions shall be 1.2 mL.

System Running

Definition of Menu Structure

The operation interface of Orion 8010cX Ammonia Analyzer is simple and easy to understand. From the definition of menu structure, the menu definition of this instrument is as follows:

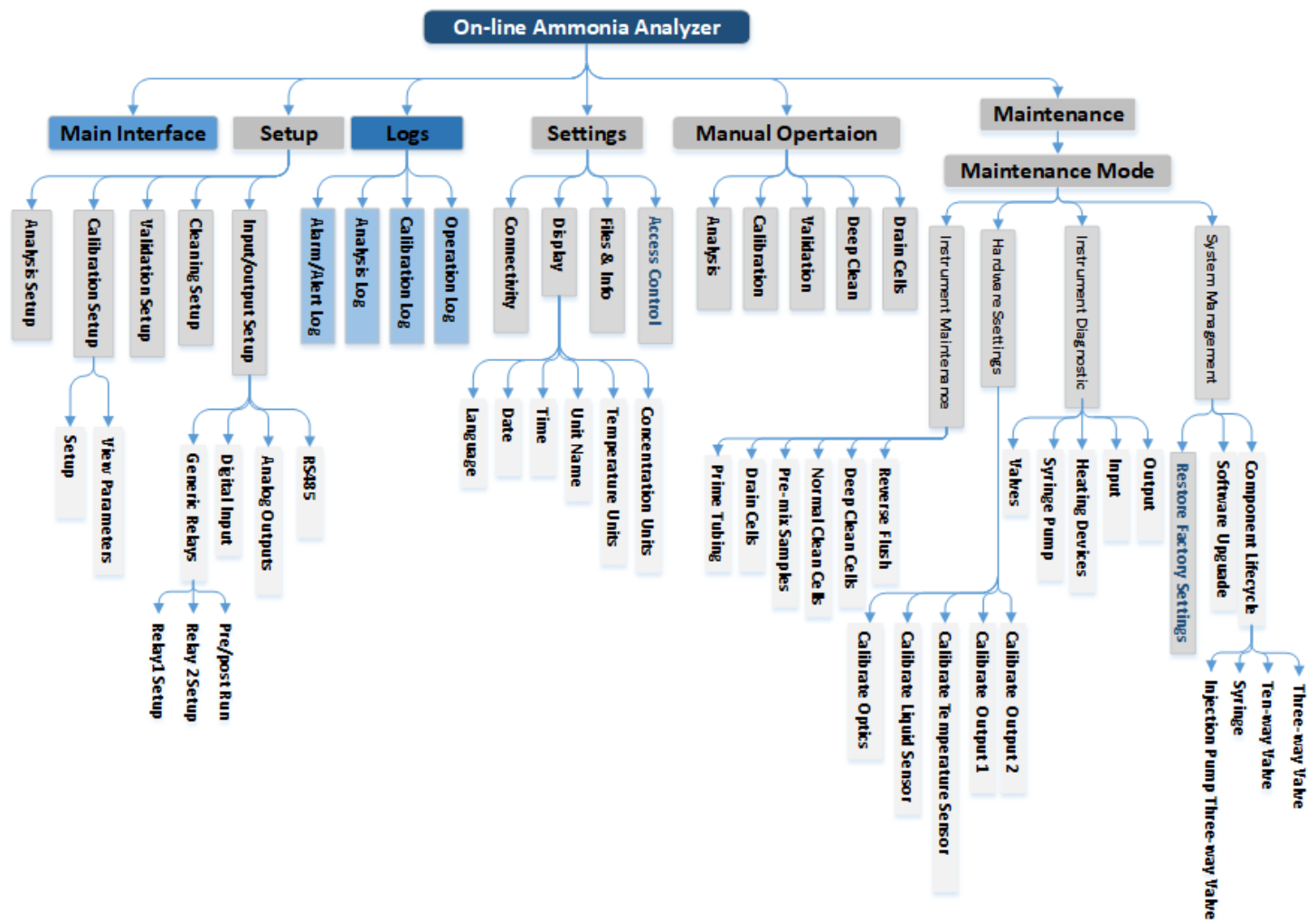


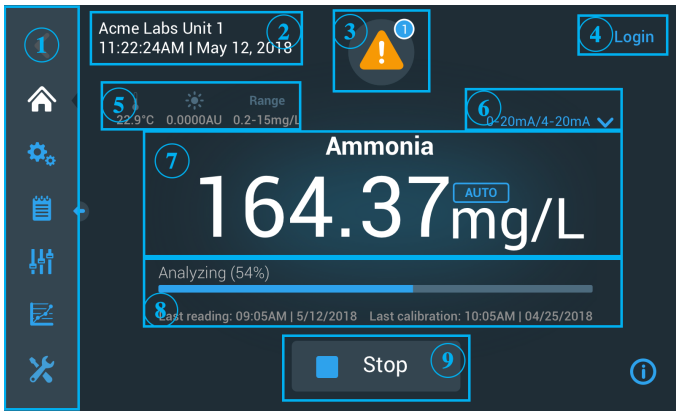
Figure 22. Menu Structure of Orion 8010cX Ammonia Analyzer

Note: The menu structure of Ammonia Analyzer will be slightly different between different versions. It is suggested that it shall be subject to the actual version.

Main Interface

The analysis main interface includes the navigation bar, equipment name, time, date bar, equipment status



identification icon, user login port, icon identification area, measurement index and measurement result display area of external output indication bar, progress bar, last measurement and calibration time display area, operation area and other basic parts. Refer to **Figure 23** for details.



- | | | | |
|---|-------------------------------|---|--|
| 1 | Navigation Bar | 6 | Analog Signal Output Display Area |
| 2 | Equipment Name, Time and Date | 7 | Measurement Index and Measurement Result Display Area |
| 3 | Equipment Status | 8 | Progress Bar, Last Measurement and Calibration Time Display Area |
| 4 | Login Port | 9 | Main Interface Operation Area |
| 5 | Icon Identification Area | | |


Figure 23. Main Interface of Orion 8010cX Ammonia Analyzer

Navigation Bar: Navigation bar is mainly used for quickly entering specific interfaces. You may click the navigation bar to enter to the corresponding interfaces, which includes return, main interface, parameter setting, recording, general setting, manual operation (measurement) and maintenance. Among them, the return icon is only valid when it is not on the main interface, and is used to return to the upper directory of the current UI interface. The main interface UI quickly returns to the main interface under any interface. The navigation bar would appear in each interface.

Only in the main interface, you can click the arrow “” in the middle of the navigation bar to hide the navigation bar. After that, click “” to return to the state with the navigation bar.



Equipment Name, Time and Date: The equipment name is used to indicate the name of the current equipment. Time/Date displays the current time/date.

Equipment Status Identification: The equipment status identification is used to indicate the status of the equipment. Under normal conditions, the equipment status identification is green  type. When there is a fault or alarm, the identification changes to another form. See **Figure 24**.

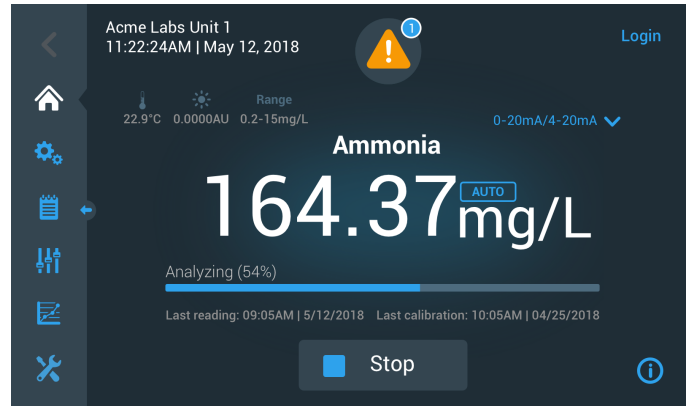


Figure 24. Main Interface of Orion 8010cX Ammonia Analyzer in Case of Alarm

Icon Identification Area: Icon identification area is used to display the currently set reaction temperature, absorbance measured last time, and currently set measuring range.

Measurement Index and Measurement Result Display Area: The area is used to mark the items and test results tested by this instrument. In the measurement result display area, the unit and current measurement mode of the measurement result can be displayed at the same time.

Progress Bar: The progress bar is used to indicate the progress of the current operation. Through the progress bar, the current operation process can be judged.

Last Measurement and Calibration Time Display Area: It is used to display the last measurement time and the last calibration time. When the calibration time is relatively long ago, automatic or manual calibration is recommended.

Main Interface Operation Area: The main interface operation area is used to operate the current running state, including running and stop. The current operation of the equipment can be stopped or the equipment can be started. In the idle state, click the start button to start a measurement; When the system executes the process, click Stop, and the measurement system would enter the reset and emptying process and terminate the current operation. Therefore, caution is required when executing the stop operation.

Return Key

The navigation bar return key is used to return from the lower level interface to the previous level interface. The main interface navigation bar is used to return to the main interface from all levels of sub-menus.

Parameter Setting

The parameter setting interface is used to set measurement, calibration, deep cleaning and input/output. If you want to change the measurement mode, such as setting the manual mode, automatic mode, measuring range, etc., you need to enter the Measurement Setting interface. If you want to change the calibration parameters, including concentration and measuring range, enter the Calibration Setting interface for setting. Deep cleaning is used to set the period of deep cleaning, and the Input/Output Setting is used to set input/output.

Table 10. Definition of Analysis Parameters


Measurement Parameters	Sub-options	Definition of Parameter
Analysis mode	Manual	In this mode, the “Analysis Cycle” cannot be edited, and the analysis is started only once by pressing [Start] each time. After the analysis is completed, the equipment enters the idle state.
	Automatic	In this mode, the “Analysis Cycle” can be edited. Press [Start] to start a periodic and continuous analysis. The time interval between the start of two adjacent analyses is the set analysis cycle.
Automatic analysis cycle	/	The analysis cycle can be set as a continuous analysis or any time between 45 minutes and 720 minutes.
Analysis measuring range	Range 1	It is often used to test the water sample within the concentration range of 0.02 mg/L ~ 2 mg/L.
	Range 2	It is often used to test the water sample within the concentration range of 0.1 mg/L ~ 15 mg/L.
	Range 3	It is often used to test the water sample within the concentration range of 0.5 mg/L ~ 30 mg/L.
	Range 4	It is often used to test the water sample within the concentration range of 2 mg/L ~ 100 mg/L.
	Range 5	It is often used to test the water sample within the concentration range of 5 mg/L ~ 500 mg/L.
Cleaning after analysis	Times of cleaning	Enter the required cleaning times manually. Note: When times of cleaning here is set as N, and N times of cleaning will be added in the automatic analysis process.
Water sample pre-stirring	/	Use an injection pump to extract air, and stir the water sample in flow cell reversely.

Table 10. Definition of Analysis Parameters

Measurement Parameters	Sub-options	Definition of Parameter
Water sample pre-load volume	/	Before each measurement, the volume pre-loaded into the water sample tube with fresh water sample.
Response time	/	The reaction time of the mixed solution in the reaction cell is recommended to be 3 minutes.
Reaction temperature	/	Temperature of reaction cell and measuring cell is recommended to be 45°C.

Measurement Setting

The measurement setting is used to set information such as whether the analysis process is initialized, whether the sample is premixed, the measurement mode, the start time of automatic measurement (only valid in periodic measurement of the automatic mode), periodic interval, whether continuous measurement is performed, measurement object, measurement range, whether automatic range switching is performed, the range is switched with automatic range switching ON, reaction temperature, reaction time, times of cleaning, pre-loaded sample volume, etc. Different parameters can be selected by using the up/down arrows on the right.

Whether it is initialized automatically, whether the sample is premixed, whether the continuous measurement is enabled (only valid in the automatic measurement mode), and whether the automatic measuring range is switched through tick marks. When it is set as Enable (the option bar is highlighted at this moment with \surd , as shown in the figure ) , the corresponding function is enabled, otherwise it is not enabled.

If it is set as the automatic initialization, when the instrument is abnormal or powered off and start up again, the instrument will perform emptying and cleaning operations. This process is an important guarantee for accurate measurement, so **it is recommended to open automatic initialization when the instrument is used.**

Set the measurement mode (including manual or automatic mode), start time of automatic measurement (set the start time of automatic measurement, it is only valid when the measurement mode is automatic and continuous measurement is not enabled), measurement object (including ammonia nitrogen, ammonia and ammonium radical), measuring range, reaction temperature, times of cleaning, pre-loaded sample volume, etc.

Pre-loaded sample volume: the pre-loaded sample volume is related to the sample tube length. By this way, it is necessary to ensure that the sample can fill the tube after sample pre-loaded. The pre-loaded sample volume setting can be calculated according to the following formula: $\text{sample tube length} \div 50 \times 1 + 0.2$ (mL). For example, when the sample tube length is 60 cm, the pre-loaded sample volume is: $60 \div 50 \times 1 + 0.2 = 1.4$ (mL). The default value of the pre-loaded sample volume is 1.2 mL. After the sample pre-loaded (see **Priming**), you can check whether the sample tube is filled with the sample to judge whether the pre-loaded sample volume is appropriate.

Calibration Setting

Calibration setting is used to set and view calibration-related parameters. In the setting section, you can set whether to perform automatic calibration, the range and concentration of calibration, the allowable deviation of calibration, the calibration cycle (valid only in the mode of automatic calibration), the response mechanism for calibration failure, the response mechanism for successful calibration, etc.

Calibration settings include calibration points in the calibration range, allowable deviation of calibration, automatic calibration or not, etc. In Orion 8010cX Ammonia Analyzer, standard curve information of each measuring range is preset to provide more protection for calibration.

During calibration settings, it is required to check the concentration of the calibration solutions using the measuring range. Only under the conditions of correct calibration concentration setting and correct calibration solution can accurate measurement results be obtained.

During the automatic range switching and automatic calibration, attention should be paid to the range of automatic

calibration. The range of automatic calibration is recommended to be the most commonly used range. At the same time, the range that is not used very often is the regular and manual calibration. The increased measurement error caused by the changes to environmental conditions and other conditions can be avoided through calibration.

Verification (Manual or Auto-validation) settings

Verification is also referred to as standard sample verification, which uses a standard solution of known concentration to verify the accuracy of the instrument after last calibration. Standard solutions with known concentrations are generally used for verification. Verification can be performed manually or automatically at a set interval. The verification settings include enable, first start time, interval, standard sample concentration, allowable deviation range, and automatic verification interval. To set verification settings, go to manual operation → verification on touch screen.

When the automatic verification is set to on, the instrument will automatically run verification according to the set interval to check the accuracy of the analyzer.

The automatic verification start time refers to the time when the automatic verification is turned on for the first time. The setting of this time will affect the validity of the data (the number of data measured in cycles). In the actual setting, it is recommended that the cycle start time +30 min, which is 30 minutes later than the cycle measurement.

The interval (verification period) refers to the interval of automatic verification. In the application of waste sample, it is recommended to set it to 24h.

Standard solution concentration: The standard solution concentration is the concentration of the standard solution that is used for automatically verification. The difference between the automatic verification result and the standard concentration is the automatic verification variance.

The allowable deviation refers to the maximum allowable variance of the result of automatic standard verification. When automatic verification is turned on, the verification result exceeds the allowable deviation, and the standard sample verification exception handling mechanism (automatic calibration, etc.) is automatically activated.

When the measured variance exceeds the allowable deviation, the instrument will conduct an auto-calibration and

rerun the validation test to ensure the instrument is accurate enough for the measurement.

Remarks: The concentration of standard sample verification is calculated as Ammonia in the form of Nitrogen.

Deep Cleaning Setting

Special deep cleaning solution is must be used for deep cleaning. When setting up this interface, ensure the relevant settings are within a reasonable range, otherwise it will cause abnormal data or even unnecessary hazards, therefore, you must be careful.

Deep cleaning is used to deal with the abnormal data caused by material adhesion in the tube, reaction cell and measuring cell. It is not a necessary process, and this function is only needed when necessary.

The Deep Cleaning Setting mainly sets up whether to perform the deep cleaning or not and the interval of automatic deep cleaning. When the automatic deep cleaning is enabled, the interval of deep cleaning can be set.

Input/Output Setting

This interface is used to set up the relay, digital input, analog output, RS485, etc.

Relay Setting: It is used to set up relays (including 2 relays) and pre/post-running. Relay is mainly used for external output, and pre/post-running is used for control of other peripheral equipment. The relays and pre/post-running are mutually exclusive.

Relay setting includes the Off setting and operating mode setting (alarms and events). **The working mode includes the alarms and events, in which, the working mode and Off are mutually exclusive.**

Alarms will occur in the following three cases: exceeding the upper limit or the lower limit. In the on-line environmental detection of ammonia nitrogen at discharge ports, exceeding the upper limit is most commonly used. For example, the environmental protection requirement of a discharge port is 4.5 mg/L, generally, it is required to raise an alarm when exceeding 4.5 mg/L, which can be realized by exceeding the upper limit. If the upper limit range for the upper/lower limit is set to 4.5 mg/L, then an alarm will be output when the concentration exceeds 4.5 mg/L. If the measured value lower

than a lower limit value is lower than a certain defined range, an alarm will be given.

At the same time, the alarm also has a feature to delay.

Event refers to marking the current action, including measurement, calibration and deep cleaning.

Pre-running/post-running Functions: According to different site applications, when other external equipment is required to run for a period before triggering the Ammonia Analyzer for analysis, the pre-run function must be initiated (e.g. in the event that a sample conditioning system is installed).

Similarly, other external device need to be triggered and started after the analysis of the Online Ammonia Analyzer is completed, the post-run function must be started.

Pre-running: Select “Parameter Setting” >> “Input/Output” >> “Pre-/Post-Running” to set the pre-running command.

Post-running: The post-running setting is similar to the pre-running setting. Select “Parameter Setting” >> “Input/Output” >> “Pre-/Post-running” to set post-running commands.

Digital Input: It is used to set the functions and delay. Functions include measurement, deep cleaning, calibration, emptying and stop or none. When it is set to the corresponding function, the corresponding function is started when there is an input. The delay is used to set a specific time delay after input and then execute the corresponding function. This instrument provides two digital inputs, which can be configured separately.

Analog Output: It is used for 4 - 20 mA external output. It can be set to OFF or 4 - 20 mA. When set to 4 - 20 mA, the corresponding values of 4 mA (lower limit) and 20 mA (upper limit) need to be set. This instrument provides two digital outputs which can be configured separately.

MODBUS Output (RS485): RS485 is used to set the station address, baud rate, calibration mode, data bit and stop bit.

Record Query

Record query is used to query various records, including alarm records, measurement records, calibration records and operation records. Click different record bars to enter different record query interfaces.

Alarm Records

Alarm records are used to record various alarms and fault events occurring during the operation process of the instrument, including the time, date, event, current status of event and alarm code. When querying alarm records, you can query based on time (including 1 week, 1 month, 3 months, 6 months, 1 year and all). Alarm records can be exported when you are authorized. When exporting, a designated type of USB storage device must be connected to the instrument.

Currently-supported USB types: USB devices of fat32 file system. It is recommended to use standard USB devices from Thermo Fisher Scientific or USB devices (less than 64G) from SanDisk and Kingston brands.

Measurement Records

Measurement record query is used to view and export test results, including the measurement time, date, and measurement details, etc. Click the detailed information of each measurement to view the measurement status, analysis time, concentration, sample absorbance, measuring range and other specific information. When querying measurement records, you can query based on time (including 1 week, 1 month, 3 months, 6 months, 1 year and all). When you are authorized, you can export measurement records. When exporting, a designated type of USB storage device needs to be connected to the instrument.

Calibration Records

Calibration record query is used to view and export calibration results, including the time, date, and calibration information. Click each calibration information once to view detailed recording parameters, including the calibration status, calibration time, calibration concentration, blank absorbance, absorbance of standard solution, intercept, slope and calibration range. When querying calibration records, you can query based on time (including 1 week, 1 month, 3 months, 6 months, 1 year and all). When you are authorized, you can export calibration records. When exporting, a designated type of USB storage device is required to be connected to the instrument.

Operation Records

Operation record query is used to view and export instrument operations. Relevant login and operation records can be viewed.

General Setting

General setting includes the connection setting, display setting, instrument information, authority management, etc. It is used to set up the connection and display-related options (including basic options such as language, time and date, region, instrument name, temperature unit, concentration unit, etc.), while instrument information provides the information query of instrument model, serial number, software version number, etc. It is used in login interface, and is used for users with different permissions to log in.

Display Setting

Display setting is used to set language, date, time, region, instrument name, temperature unit, and concentration unit. You can choose different languages and set date or time. After the instrument name is set, the set instrument name will be displayed on the main interface. You can choose Celsius or Fahrenheit degree for temperature unit. Concentration units include mg/L and ppm, which can be pulled up or down by the up and down arrows on the right.

Language Setting: It is used to select the language displayed on the interface. By sliding or clicking up and down buttons, select the desired language. Click “Save” and the instrument is set to the desired language.

Date: Date setting includes selecting three different display modes: month/day/year, day/month/year and year/month/day, meanwhile specific month, date and year can be set. When setting a month, date and year, you can select by clicking the up and down arrows or sliding the corresponding panes of month, date and year. Click Save to save the settings. After saving, you can exit or enter other interfaces.

Time: The time formats can be set, including the 12-hour system and 24-hour system. If you choose a different time format, the selected different time format will be displayed. Click Save to save the settings. After saving, you can exit or enter other interfaces.

Instrument Name: It is used to set the name of the instrument as required. After the name is changed, the set name is displayed on the instrument name position of the interface.

Temperature Unit: It is used to set the temperature units. The temperature units can be set as needed. After the temperature units are changed, the selected units are shown on the display.

Concentration Unit: It is used to set the units of measurement. The concentration units are mg/L or ppm and can easily be selected. After selection, click “Save” to end setting. After saving, you can exit or enter other options.

Instrument Information

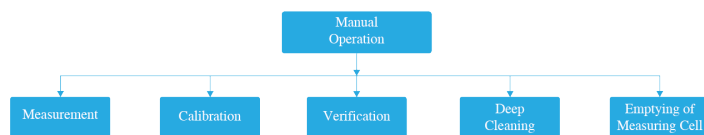
The instrument information is used to display the instrument model, serial number, and software version number.

Authority Management

The authority management interface can be used to set whether permission control is required or not. When selecting permission control, the instrument sets multi-level permissions and can distribute different permission passwords to different permission groups according to the needs of users.

Manual Operation

Orion 8010cX Ammonia Analyzer provides users with analysis operation, calibration operation, deep cleaning operation, and emptying processes.



Measurement

This measurement is the manual measurement. Click “Start” to measure according to the set parameters. On this interface, you can see relevant measurement parameters and measurement progress. Before measurement, it is recommended to check the measurement parameters. If any modification is needed, you need to enter the parameter setting interface to modify the parameters, and enter the manual measurement interface again after saving. Suggested verification items include information such as the range, measurement methods, digestion reaction temperature, pre-loaded sample volume, and whether automatic switching of measuring range, so as to ensure that the current operation is the action or process that the user really wishes to implement.

During program execution, the current operation can be stopped by clicking “Stop” button, but the user is not recommended to use the “Stop” function under this scenario.

Calibration

This calibration is the manual calibration. Click “Start” to implement manual calibration. Before calibration, it is recommended to confirm the calibration range, standard liquid concentration, allowable deviation and calibration failure response mechanism. If the above parameters need to be modified, you need to enter the parameter setting interface to modify the parameters, and enter the manual interface again after saving.

During program execution, the current operation can be stopped by clicking “Stop” button, but the user is not recommended to use the “Stop” function under this circumstance.

Verification

Verification is used to verify the accuracy of the instrument. Generally, the standard solution with known concentration is used for verification. Insert the sample tube into the solution to be verified, ensure that the instrument can extract the sample, meanwhile check the measuring range and parameters to be verified. Then click the “Start” button for verification. During verification, ensure that the instrument is in the idle state.

When the user is conducting instrument verification, it is recommended that the standard sample shall be purchased

from formal channels and used directly or diluted as required. During calibration of the instrument, the concentration of the standard sample with known concentration shall be within the measuring range set by the instrument.

After the instrument calibration is finished, the instrument will give the results of this calibration test. After the user clicks “Confirm”, the instrument calibration is finished.

The calibration result of the instrument will be kept in a test record, and a special mark will indicate that the test record is generated from the instrument calibration. When the user needs to view the verification result, he/she can enter the measurement record query item to view through log navigation.

Deep Cleaning



DANGER: Exposure to an inhalation of chemicals are hazardous. Only trained and qualified personnel can perform the work described in this section of the user manual.

Deep cleaning solution (either concentrated sulfuric acid $\geq 90\%$ or 10% HCL) is required for deep cleaning. It is recommended to purchase these chemicals from your local chemical suppliers.

When a dirty measuring cell or tube may affect measurement, it is recommended to implement deep cleaning. The special cleaning solution is required for deep cleaning. It is recommended to contact the supplier. Insert the corresponding tube to be suffered the deep cleaning into the cleaning solution, and then click the “Start” button to implement deep cleaning.

If deep cleaning needs to be stopped, click the “Stop” button, but this operation is not recommended. Special reagents are used for deep cleaning, which may have certain risks. Therefore, it is recommended to let the instrument automatically end during deep cleaning.

After deep cleaning, it is recommended to recalibrate the liquid level sensor and LED, and then recalibrate the required measuring range. Otherwise, the performance of the instrument may not meet the set requirements.

Emptying of Measuring Cell

After startup, conduct emptying operation on the measuring cell.

Maintenance Function

Before entering the maintenance function, the corresponding permission is required. During equipment maintenance, all operations are slightly different from those in non-maintenance mode in data identification, data result transmission and storage.

Only when entering the maintenance mode, can maintenance be conducted. Maintenance includes the operations of routine maintenance, hardware maintenance, equipment self-detection and system management. When entering the maintenance interface and checking the maintenance mode, the interface will prompt “Entered the maintenance mode”. Maintenance operations such as the instrument maintenance, hardware maintenance, etc. can only be carried out after entering the maintenance mode.

It is recommended to enter the maintenance mode only in the idle state. If the maintenance mode is checked in the non-idle state, the current operation needs to be stopped for emptying and cleaning, and the maintenance operation cannot be carried out until the emptying and cleaning are finished.

Tube Pre-loading: For each instrument operation, the tube pre-loading (priming) is a process that must be implemented. Tube pre-loading includes the water sample pre-loading, standard liquid pre-loading, reagent 1 pre-loading, reagent 2 pre-loading, reagent 3 pre-loading, and deionized water pre-loading, etc.

When selecting the corresponding item, set the pre-loaded volume, and then click “Start” to start tube pre-loading.

Emptying of Reaction Cell and Measuring Cell: It is used to emptying the reaction cell and measuring cell. After entering the sub-item, click “Start” to start the sub-process.

Sample Premixing: It is used to mix samples. Click “Start” to start the sub-process.

Routine Cleaning: It is used for the routine cleaning of the measuring cell and reaction cell. DI water is injected into the measuring cell and reaction cell several times, and conduct mixing to clean the possible common residues in the measuring cell and reaction cell. After entering this interface, click “Start” to start routine cleaning.

Deep Cleaning: For deep cleaning, see **Manual Operation** (measurement) part: Deep Cleaning.



DANGER: Exposure to an inhalation of chemicals are hazardous. Only trained and qualified personnel can perform the work described in this section of the user manual.

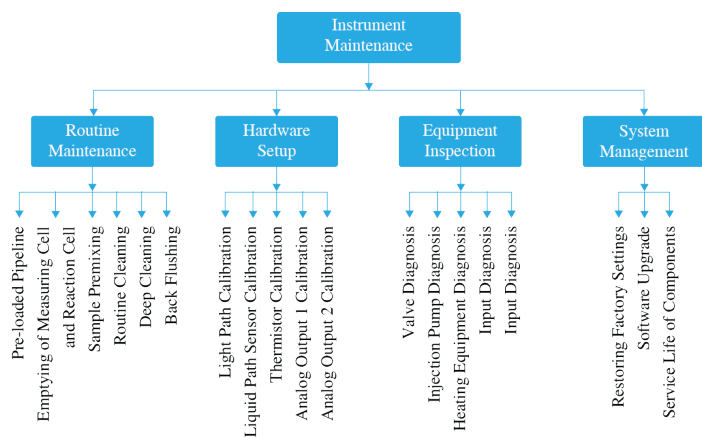


Figure 25. Instrument Maintenance

Routine Maintenance

Instrument maintenance includes the operations of pre-loading tubes, emptying of the measuring cell and reaction cell, sample pre-mixing, routine cleaning, deep cleaning, and back flushing, etc.

Deep cleaning solution (either concentrated sulfuric acid $\geq 90\%$ or 10% HCL) is required for deep cleaning. It is recommended to purchase these chemicals from your local chemical suppliers.

Back Flushing: It is used to clean calibration fluid, and tube lines R1, R2 and R3. When using this function, ensure that the tube line is not connected to the solution bottle, otherwise it may cause contamination of solution. During back flushing, DI water back flushing is adopted. After entering back flushing interface, click “Start” to start back flushing process.

Hardware Setting

Hardware setting is used to set the relevant hardware of the instrument, including light path calibration, liquid path sensor calibration, thermistor calibration, analog output 1 calibration and analog output 2 calibration.

Light Path Calibration: It is used for the correction of light path. When the instrument has been used for an extended time, the light source and measuring cell may be subject to slight changes. Through the light path calibration, the influence of these slight changes on measurement can be minimized. When performing the light path calibration, ensure that DI water has been introduced. After entering the interface, click “Start” and the interface will show that LED calibration is in progress. Click “Stop” to stop this process, but then the system would enter the cleaning and emptying process. After the LED calibration is finished, click “Confirm” and the system would pop up current and voltage values of LED calibration.

Calibration of Liquid Path Sensor: Proceed by entering the sub-menu for the liquid path sensor calibration option and click the “Start” button, the instrument will initiate the process liquid sensor calibration. After calibration, click “Confirm” and the system will display the calibration parameters for liquid sensor.

Thermistor Calibration: It is mainly used to calibrate the reaction temperature. When there is a deviation in the reaction temperature, the calibration of thermistor can be conducted. Accurately measure the temperature of the reaction cell, then input the measured temperature and click “Save”, and then the thermistor calibration is completed.

Analog Output Calibration: It is used to calibrate analog outputs and requires a high precision 900 Ω resistor. Connect the resistor to the analog output to be calibrated, then connect the multi-meter to measure current output, and use “-” and “+” to adjust current value to 20 mA.

Instrument Diagnosis

Instrument diagnosis is used to diagnose the core components of the instrument. Instrument diagnosis includes valve diagnosis, injection pump diagnosis, heating equipment diagnosis, input diagnosis and output diagnosis.

Valve Diagnosis: It is used to diagnose the ten-way valve and reagent switching three-way valve. For the ten-way valve, the current position will be displayed, and the target position can be set. The reagent switching three-way valve includes a left side and a right side, and the status position can be changed by switching. After the setting is finished, click “Execute”, and the ten-way valve and reagent switching three-way valve will be switched according to the set positions.

Injection Pump: It includes three-way valve position, injection pump target position, injection speed and delay. The Left and Right are used to determine whether the valve port at the upper end of the injection pump is on the left side or right side. The Position of Injection Pump is used to determine the position of the injection pump. When the current position is greater than the set value, it is push. When the current value is less than the set value, it is suction. Click “Execute” to execute according to the set parameters. When clicking “Initialize”, the pump will reset.

Heating Equipment: It is used to control heating and read the current temperature of the reaction cell and measuring cell. When the heating device is turned off, the current temperature will gradually decrease. Be sure to turn on the switch of heating device when exiting the heating equipment diagnosis, so as to avoid abnormal measurement problem caused by switching off the heating device.

Input: Input diagnosis is used to diagnose the state of inputs. Through input diagnosis, the state of digital input 1 and digital input 2 can be seen to be On or Off.

Output: Output diagnosis is used to diagnose analog outputs and relays. Set the analog output value, and then an external instrument can be used to test the corresponding current value at the same time to compare with the output, so as to judge whether the analog output is accurate. For a relay, it is to test whether it is On or Off, set On or Off at the same time, and then test the state of the relay, so as to know whether the relay performs according to the setting.

System Management

System management includes Restoring Factory Settings, Software Upgrade, and Service Life of Components. Restoring Factory Settings is used to restore the original factory state, Software Upgrade is used for upgrade software, and Service Life of Components is used to view the overall service life and remaining service life of the instrument.

Restoring Factory Settings: It is used to restore the original factory state. When restoring factory settings, note that once the recovery is implemented, all data and settings except the factory calibration curve will be deleted and the instrument will restart.

Software Upgrade: It is used for upgrading software. When the software is upgraded, insert a USB storage device containing the software package, and then click the “Upgrade” button, the system will upgrade automatically, and the instrument will restart automatically after the system upgrade.

Service Life of Components: It is used to read the service life and expected remaining service life of injection pump three-way valve, injection pump, ten-way valve and three-way valve.

Injection Pump Three-way Valve: It is a component of the injection pump. Through the service life interface of the injection pump three-way valve, the overall service life, current service life and last reset time of the three-way valve can be seen. When replacing the three-way valve, the three-way valve needs to be reset.

Injection Pump: Through the service life interface of the injection pump, the overall service life, current service life and last reset time of the injection pump can be seen. When replacing the three-way valve, the injection pump needs to be reset.

Ten-way Valve: Through the service life interface of ten-way valve, the overall service life, current service life and last reset time of the ten-way valve can be seen. When replacing the ten-way valve, the ten-way valve needs to be reset.

Three-way Valve: Through the service life interface of three-way valve, the overall service life, current service life and last reset time of the three-way valve can be seen. When replacing the three-way valve, the three-way valve needs to be reset.

Heating Equipment: It is used to control heating and read the current temperature of the reaction cell and measuring cell at the same time. When the heating device is turned off, the current temperature will gradually decrease. Be sure to turn on the switch of heating device when exiting the heating equipment diagnosis, so as to avoid abnormal measurement problem caused by switching off the heating device.

Input: Input diagnosis is used to diagnose the state of input. Through input diagnosis, the state of digital input 1 and digital input 2 can be seen to be On or Off.

Output: Output diagnosis is used to diagnose analog outputs and relays. Set the analog output value, and then an external instrument can be used to test the corresponding current value at the same time to compare with the output, so as to judge whether the analog output is accurate. For a relay, it is

to test whether it is On or Off, set On or Off at the same time, and then test the state of the relay, so as to know whether the relay performs according to the setting.

Regular Maintenance

The case of Orion 8010cX Ammonia Analyzer has a protection lock, which can only be opened by a key. After it is opened, you can update reagents, adjust parameters, and carry out related regular maintenance work. Arrange a special instrument maintenance person to properly keep the key.



WARNING: Only qualified Thermo Fisher Scientific certified service trained personnel can maintain the equipment to avoid any injury and malfunction of the equipment. Reagents in the instrument are corrosive!

Regularly check the whole system to see if there are any abnormal parts;

Regularly check all fluid path connections to see if there is leakage or corrosion;

Regularly check the sealing of the syringe pump: check whether there are bubbles generating in the syringe pump when the push rod of syringe pump is moving downward;

Regularly check the circuit board and cables on the back of the flow path board for corrosion or damage.

General Maintenance

Regularly check whether reagents, deionized water and the like are insufficient, and check whether the liquid waste tank needs to be emptied and disposed;

Regularly check whether the flow cell needs to be dredged and whether the filter screen needs to be cleaned;

Regular Maintenance

Refer to **Table 11** for the regular maintenance plan recommended by Orion 8010cX.

Table 11. Regular Maintenance Plan

Items of regular maintenance	Maintenance cycle				
	Customer self-maintenance			Trained maintenance personnel	
	Weekly	Every four weeks	Every two months	Every six months	Every twelve months
Calibration curve	√				
Cleaning the flow cell	√				
Deep cleaning the sample injection tube, reaction cell, and measuring cell	√				
Cleaning and filling of the deionized water tank		√			
Empty the liquid waste tank and put the liquid waste tube in place		√			
Replace a new reagent and standard solution (without a refrigerator)		√			

Table 11. Regular Maintenance Plan

Items of regular maintenance	Maintenance cycle				
	Customer self-maintenance			Trained maintenance personnel	
	Weekly	Every four weeks	Every two months	Every six months	Every twelve months
Replace a new reagent and standard solution (with a refrigerator)			√		
Replace the sample injection tube				√	
Replace the liquid storage ring				√	
Replace a new cleaning solution				√	
Replace the syringe pump sealing gasket with a new one				√	
Replace the syringe pump with a new one				√	
Update all PTFE tubes and tubeline fittings					√

Note: After replacing the sample injection tube, the filling volume of the water sample needs to be adjusted according to the length of the sample injection tube;

Note: After moving the sensor (including replacing the liquid storage ring, repairing the rotary valve, etc.), the liquid sensor needs to be recalibrated;

Cleaning

This instrument supports two cleaning functions: **deionized water cleaning** and **deep cleaning of cleaning solution**.

Deionized water cleaning function is simply called as the cleaning in the instrument menu and this Manual. It uses the deionized water to clean the tubeline system of the entire instrument, including the reaction cell, measuring cell, buffer ring, etc. The necessary cleaning function has been integrated into the analysis process of the instrument, and what can be used by the user is the function of manual cleaning. The occasions requiring the manual cleaning include: multiple manual cleaning operations are required before the instrument is ready for a long-term shutdown, and multiple manual cleaning operations are required before the instrument is recovered for usage after a long-term shutdown.

The deep cleaning function of cleaning solution is simply called as the deep cleaning in the instrument menu and this Manual. It uses the special cleaning solution to thoroughly clean the sample injection tube, buffer ring, reaction cell and measuring cell, thus eliminating bacteria and removing dirt in the tubeline system. During a long-term operation of the instrument, it is recommended that the user shall conduct a deep cleaning of the instrument tubeline system every week and replace the cleaning solution once every 6 months.

Liquid Leakage Maintenance

If there is a fluid leak in the analyzer and it collects in the bottom of the enclosure an alarm is activated. If the fluid accumulates the analyzer will stop any measurements for the purposes of safety. If a fluid leak alarm is activated, proceed with the following steps:




1. Power off the ammonia nitrogen instrument.
2. Put on protective gloves, goggles and protective clothing.

3. Remove the reagent bottle, standard solution bottle, water sample bottle and other items from the instrument.
4. Dry the tray and all liquid leakage. It is recommended that the wiped paper towel and other wastes shall be put into the disposal bag for subsequent corresponding disposal.
5. After confirming the leakage source and completing repair, switch on the power supply again to operate the instrument. Then, the next step of instrument operation can be carried out.


Note: After the leak is repaired ensure that the position where the tip of the liquid leak sensor is located is fully dry and free of residual liquid. Otherwise, the system alarm will not be eliminated after the instrument is restarted.

Long-term Shutdown

In order to prevent the crystallization of residues or sediment of other heavy dirt in the instrument tubelines, especially in the electronic rotary valve, which may block the tubelines and cause the failure when starting the instrument next time, before long-term shutdown, operate by following the following steps.

1. After entering the maintenance mode of the instrument, click the icon  >> “Instrument maintenance” >> “Routine cleaning” in the lower left corner of the main menu, and then click “Start”, then wait for the completion of the cleaning. Perform the above routine cleaning twice.
2. Insert water sample tubeline, standard solution tubeline, reagent tubeline and deionized water tubeline into a deionized water bottle. Click the icon  >> “Instrument maintenance” >> “Pre-load tubeline” in the main menu, select “All”, set the pre-loaded volume to “1.2 ml”, then click “Start” and wait for the completion of the pre-loading of all tubelines.
3. Take out the water sample tubeline and reagent tubeline from the deionized water bottle, and the standard solution tubeline and deionized water tubeline shall be maintained in the deionized water bottle. Click the icon  >> “Instrument maintenance” >> “Pre-load tubeline” in the main menu, select “All”, set the pre-loaded volume to “1.2 ml”, then click “Start” and wait for the completion of the pre-loading of all tubelines. It can be seen that the

water sample tubeline and reagent tubeline have been emptied.

4. Click the icon  >> “Instrument maintenance” >> “Instrument diagnosis” >> “Valve” in the main menu, for the target position of the ten-way rotary valve, enter “2”, and then click “Execute” to switch the ports of the ten-way rotary valve.
5. Wipe the outer wall of the chemical waste liquid and cleaning waste liquid tubelines to ensure that no waste liquid remains on the outer wall.

Note: The above operations of the ammonia nitrogen instrument are usually carried out in the instrument maintenance mode. Regarding how to enter the maintenance mode of the instrument, attend the relevant instrument maintenance training.

Common Faults and Troubleshooting Measures



WARNING: Only service personnel trained and certified by Thermo Fisher Scientific should be maintaining the equipment.

WARNING: Reagents in the instrument are corrosive.

Alarm and error information will be displayed in the main interface's history records - error and alarm information.

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
1	LED calibration abnormal or failure (E12, E13, E14)	<ol style="list-style-type: none"> 1. Confirm whether the deionized water has been contaminated, if so, replace the deionized water and then run the cleaning procedure; 2. Perform the cleaning process, clean the reaction cell and measuring cell, and then re-calibrate the light path to check whether the fault is eliminated; 3. Perform the deep cleaning process, deeply clean the reaction cell and measuring cell, and then re-calibrate the light path to check whether the fault is eliminated; 4. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
2	Measurement results higher than the upper range limit/ measurement results lower than the lower range limit (W17, W18)	<ol style="list-style-type: none"> 1. The measurement result exceeds the selected measurement range, re-select the measurement range according to the concentration of actual water sample. If it is higher than the upper limit of measurement, choose a higher range of measurement; if it is lower than the lower measurement limit, select a lower measurement range.
3	Unstable LED light source (W0, W21)	<ol style="list-style-type: none"> 1. Confirm whether the deionized water has been contaminated. If so, replace the deionized water and then run the cleaning procedure; 2. Perform the cleaning process, clean the reaction cell and measuring cell, and then re-calibrate the light path to check whether the fault is eliminated; 3. Perform the deep cleaning process, deeply clean the reaction cell and measuring cell, and then re-calibrate the light path to check whether the fault is eliminated; 4. Use the system's diagnostic function, enter the light source and detector option, turn on the LED and observe whether the PD (photo diode) detection voltage is stable; 5. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
4	Unstable temperature of the reaction cell (W1)	<ol style="list-style-type: none"> 1. When the instrument is not working, observe the temperature of the reaction cell. The temperature change of the reaction cell should be within $\pm 1^{\circ}\text{C}$; 2. If the temperature of the reaction cell changes greatly, the instrument may be failure. Contact the after-sales personnel to confirm the fault and repair it.
5	High/low ambient temperature (W2, W3)	<ol style="list-style-type: none"> 1. Observe the ambient temperature, its changes should be within the range of $5^{\circ}\text{C} \sim 45^{\circ}\text{C}$; if the temperature change exceeds the above range, turn on the air conditioner and other equipment to adjust the indoor temperature to the set range, otherwise the working performance of the instrument will be affected and even the hardware of the instrument will be damaged; 2. If the ambient temperature changes greatly, the instrument may be failure. Contact the after-sales personnel to confirm the fault and repair it.
6	High/low temperature of reaction cell (E15, E16)	<ol style="list-style-type: none"> 1. When the instrument is not working, observe the temperature of the reaction cell. The temperature of the reaction cell should be within the range of the set temperature $\pm 5^{\circ}\text{C}$; 2. If the temperature of the reaction cell deviates too much from the set temperature, the instrument may be failure, contact the after-sales personnel to confirm the fault and repair it.
7	Expiration of service life of injection pump three-way valve (W4)	<ol style="list-style-type: none"> 1. The service life of the injection pump three-way valve is designed to be 1 year. Extended service will lead to instability of the system, abnormal test results and even damage to the injection pump; 2. If the service life of the injection pump three-way valve expires, contact the after-sales personnel for maintenance and replacement.
8	Expiration of service life of syringe pump (W4)	<ol style="list-style-type: none"> 1. The service life of the syringe pump is designed to be half a year. Extended service will lead to instability of the system, abnormal test results and even damage to the injection pump; 2. If the service life of the syringe pump expires, contact the after-sales personnel for maintenance and replacement.
9	Expiration of service life of rotary valve (W7)	<ol style="list-style-type: none"> 1. The service life of the multi-way rotary valve is designed to be three years. Extended service will cause instability of the system, abnormal test results, and even damage to the instrument; 2. If the service life of the rotary valve expires, contact the after-sales personnel for maintenance and replacement.

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
10	Expiration of service life of the three-way valve (W8)	<ol style="list-style-type: none"> The service life of the three-way valve is designed to be two years. Extended service will cause instability of the system, abnormal test results, and even damage to the instrument; If the service life of the three-way valve expires, contact the after-sales personnel for maintenance and replacement.
11	Residue in the reaction cell.	<ol style="list-style-type: none"> Click the manual operation navigation icon to enter the manual operation interface; Click Manual Measurement to enter the manual measurement start-up interface, check the pre-loaded sample volume value and check the sample tube length. When the ratio of the sample tube length (unit: cm) to 50 is smaller than the pre-loaded sample volume, the sample tube needs to be pulled out and inserted into the liquid waste tank, or the pre-loaded sample volume needs to be changed. The recommended set value: sample tube length (unit: cm) / 50 + 0.2 m. Return to the main interface of Manual Measurement and click Deep Cleaning. After deep cleaning, check the residue in the reaction cell. If the residue still exists, click Deep Cleaning again until the residue is removed. After deep cleaning, it is suggested to conduct LED calibration and calibration.
12	Adherent objects in sample tube or liquid storage ring	<ol style="list-style-type: none"> Click the manual operation navigation icon to enter the manual operation interface. Click Manual Measurement to enter the manual measurement start-up interface, check the pre-loaded sample volume value and check the sample tube length. When the ratio of the sample tube length (unit: cm) to 50 is smaller than the pre-loaded sample volume, the sample tube needs to be pulled out and inserted into the liquid waste tank, or the pre-loaded sample volume needs to be changed. Recommended set value: sample tube length (unit: cm) / 50+ 0.2 mL. Return to the main interface of Manual Measurement and click Deep Cleaning. After the completion of deep cleaning, check if the adherent object exists. If it still exists, it is recommended to repeat the deep cleaning for 2-3 times. If it still exists after 2-3 times of deep cleaning, you need to enter the maintenance interface, click Hardware Maintenance, then Liquid Level Sensor Calibration to implement liquid level sensor calibration. If the calibration is successful, it can continue to be used. Directly replace the sample tube or liquid storage ring. Whether directly replace the sample tube or clean the sample tube, the liquid level sensor needs to be calibrated after cleaning or replacement.

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
13	Liquid level sensor failure or lack of liquid	<ol style="list-style-type: none"> 1. In the absence of R1, R2, R3, standard solution, sample or pure water, the liquid level sensor would give an alarm, indicating the lack of liquid. 2. When the lack of liquid occurs, the corresponding liquid needs to be supplemented. 3. When there is lack of liquid, but no alarm is given out, the liquid level sensor is abnormal or needs to be calibrated.
14	Blurred screen	<ol style="list-style-type: none"> 1. Power off for more than 15s. 2. Restart the equipment.
15	Lack of water sample (E9)	<ol style="list-style-type: none"> 1. Check whether the flow cell is full of water sample, and if there is a lack of water sample, check the external sample injection flow path. 2. Check whether the water sample tube is inserted into the bottom of the flow cell filter. 3. Check whether the connection port between the sample injection tubeline and the port 3 of the switching valve is loose, and whether there is any leakage; if so, tighten this connection terminal. 4. When the white plastic push rod of the syringe pump moves downward, check whether there are bubbles generated or a large amount of gas entering inside. If so, tighten the syringe pump or replace the syringe pump and its black flat gasket. 5. After all the above steps have been checked and the problem is solved, rerun the analysis procedure to see if the fault has been eliminated. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
16	Lack of reagent (E5)	<ol style="list-style-type: none"> 1. Check whether the reagent in the reagent 1 bottle is used up or is insufficient; 2. Whether the liquid inlet tube of reagent 1 has been inserted into the bottom of the reagent 1 bottle; 3. Check whether the reagent back flow occurs at the place where the liquid inlet tube of reagent 1 is connected to the port 9 of the switching valve; if yes, the connection terminal at this place need to be tightened; 4. After all the above steps have been checked and the problem is solved, rerun the analysis procedure to see if the fault has been eliminated. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
17	Lack of reagent 2 (E6)	<ol style="list-style-type: none"> 1. Check whether the reagent in the reagent 2 bottle is used up or is insufficient; 2. Whether the liquid inlet tube of reagent 2 has been inserted into the bottom of the reagent 2 bottle; 3. Check whether the liquid inlet tube of reagent 2 is connected to the NO port of the three-way valve, and whether the reagent back flow occurs at the COM port of the three-way valve and at the port 10 of switching valve; if yes, the corresponding connection terminals need to be tightened; 4. After all the above steps have been checked and the problem is solved, rerun the analysis procedure to see if the fault has been eliminated. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
18	Lack of reagent 3 (E7)	<ol style="list-style-type: none"> 1. Check whether the reagent in the reagent 3 bottle is used up or is insufficient; 2. Whether the liquid inlet tube of reagent 3 has been inserted into the bottom of the reagent 3 bottle; 3. Check whether the liquid inlet tube of reagent 3 is connected to the NC port of the three-way valve, and whether the reagent back flow occurs at the COM port of the three-way valve and at the port 10 of electronic rotary valve; if yes, the corresponding connection terminals need to be tightened; 4. After all the above steps have been checked and the problem is solved, rerun the analysis procedure to see if the fault has been eliminated. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
19	Lack of deionized water (E10)	<ol style="list-style-type: none"> 1. Check whether the deionized water in the deionized water bottle is used up or insufficient; 2. Whether the deionized water tube is drawn out of the water tank, or whether it is not inserted below the water surface; 3. Check whether the deionized water back flow occurs at the place where the inlet tube of the deionized water is connected to the connection terminal on the right side of the injection pump; if yes, the connection terminal at this place need to be tightened; 4. Check whether there are bubbles inside the syringe pump, especially when the white plastic push rod moves downward, if there is air being drawn in obviously. If yes, tighten the syringe pump or replace the syringe pump and its black flat gasket;

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
		5. After all the above steps have been checked and the problem is solved, rerun the analysis procedure to see if the fault has been eliminated. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
20	Lack of standard sample (E8)	<ol style="list-style-type: none">1. Check whether the standard sample in the standard sample bottle is used up or insufficient;2. Whether the standard sample injection tube has been inserted into the bottom of the standard sample bottle;3. Check whether the solution back flow occurs at the place where the liquid inlet tube of standard sample is connected to the port 2 of the electronic rotary valve; if yes, the connection terminal at this place need to be tightened;4. After all the above steps have been checked and the problem is solved, rerun the analysis procedure to see if the fault has been eliminated. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
21	Lack of cleaning solution (E11)	<ol style="list-style-type: none">1. Check whether the cleaning solution in the cleaning solution bottle is used up or insufficient;2. Whether the cleaning solution tube has been inserted into the bottom of the cleaning solution bottle;3. Check whether the solution back flow occurs at the place where the liquid inlet tube of cleaning solution is connected to the port 1 of the electronic rotary valve; if yes, the connection terminal at this place need to be tightened;4. After all the above steps have been checked and the problem is solved, rerun the analysis procedure to see if the fault has been eliminated. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
22	Rotary valve failure (E3)	<ol style="list-style-type: none"> 1. Visually check the electrical parts (rotary valve control board and serial port communication adapter board) at the rear of the electronic rotary valve for obvious corrosion. If there is any corrosion, it is necessary to power off, replace relevant parts and try again; 2. Visually inspect each connecting tubeline of rotary valve for blockage or crystal residue, if any, clean up the tubelines, or replace relevant tubelines; 3. Operate the rotary valve with the system diagnostic function of the instrument, and check whether the feedback position of the rotary valve is correct; 4. Disconnect the power supply of the instrument, power on it again, and check whether the electronic rotary valve works normally. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
23	Injection pump failure (E2)	<ol style="list-style-type: none"> 1. Visually check whether the three-way valve and syringe pump of the injection pump are normal; 2. Check whether the electrical connection of injection pump is reliable; whether there is obvious corrosion on the electrical parts, if there is any corrosion, it is necessary to power off, replace relevant parts and try again; 3. Cut off the power supply and manually push the big black sliding block under the syringe pump to see if it can move up and down smoothly. If not, remove the syringe pump and try again. If it can move up and down smoothly, the syringe pump needs to be replaced or cleaned (note that the black flat gasket should not fall off and must be installed back, otherwise serious leakage may occur); if it still fails, the injection pump needs to be replaced; 4. Restart the machine and check whether the injection pump is working properly by using the diagnostic function of the instrument; if the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
24	Three-way valve failure (E4)	<ol style="list-style-type: none"> 1. Visually inspect each connecting tubeline of three-way valve for blockage or crystal residue, if any, clean up the tubelines, or replace relevant tubelines; 2. Operate the three-way valve with the system diagnostic function of the instrument, and the three-way valve will give out a loud switching sound when it works normally; 3. Cut off the power supply of the instrument, power on it again, and check whether the electronic rotary valve works normally. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
25	Failure of liquid sensor calibration (E17)	<ol style="list-style-type: none"> 1. Visually check whether the buffer ring detected by the liquid sensor is discolored and contaminated. If it is contaminated, at first, use the deep cleaning function to clean the buffer ring. If it still fails, it needs to be removed for manual cleaning; 2. Check whether the cable of the liquid sensor is loose and has a poor contact; 3. Operate the liquid sensor with the system diagnostic function of the instrument, and check whether the voltage of the liquid sensor is correct when the buffer ring is in the state of empty tube (filled with air) or full tube (filled with deionized water); 4. Cut off the power supply of the instrument, power on it again, and calibrate the liquid sensor. If the fault still occurs, contact the after-sales personnel to confirm the fault and repair it.
26	Calibration curve expires (W19)	<ol style="list-style-type: none"> 1. Confirm that curve calibration has been done under the current measuring range and the calibration is successful; 2. Enter Parameter Setting-Calibration Parameters-Current Parameters, view the current curve information, and check whether the current curve and factory curve information are existing; 3. When the current calibration curve exceeds the time limit by one month, the curve needs to be re-calibrated.
27	Failure of LED calibration (The high value exceeds the limit value (E29)	<ol style="list-style-type: none"> 1. Check whether the calibration setting concentration is consistent with the current calibration concentration; if they are inconsistent, conduct the modification and calibration; 2. Shut down the instrument, remove the LED and PD, and observe whether there are impurities or dirt on the light path. If there is dirt, use cotton swabs dipped in alcohol to clean it; 3. Turn on the instrument and use the maintenance function of the instrument to deeply clean the M-cell; 4. After all the above steps have been checked and the problem is solved, recalibrate LED; if the fault still occurs, please contact the after-sales personnel to confirm the fault and repair it.
28	Failure of LED calibration (The high or low value exceeds the limit value by 20%)	<ol style="list-style-type: none"> 1. Shut down the instrument, remove the LED and PD, and observe whether there are impurities or dirt on the light path. If there is dirt, use cotton swabs dipped in alcohol to clean it; 2. Turn on the instrument and use the maintenance function of the instrument to deeply clean the M-cell; 3. After all the above steps have been checked and the problem is solved, recalibrate LED; if the fault still occurs, please contact the after-sales personnel to confirm the fault and repair it.

Table 12. Alarm/Fault Information and Troubleshooting Methods

No.	Alarm Information	Troubleshooting Methods
29	Communication error (E31)	<ol style="list-style-type: none"> 1. Shut down the instrument, and visually observe whether the cable between main control panel and measurement interface drive board MCB is connected correctly and firmly. If necessary, unplug and plug the cable again; 2. Turn on the instrument, and check whether there is still a prompt of communication error; 3. If the fault still occurs, please contact the after-sales personnel to confirm the fault and repair it.
30	Liquid leakage	<ol style="list-style-type: none"> 1. Cut off the power supply of the instrument, visually check the leakage position of tubelines and devices, determine the leakage source, and then carry out maintenance (see Instrument Diagnosis for specific information); 2. Possible causes of liquid leakage: <ul style="list-style-type: none"> • Loose tubeline connection terminals leads to leakage of liquid; • Improper connection of tubes results in leakage of liquid; • Broken reagent bottles result in leakage of liquid; 3. Cracked reaction cell or measuring cell results in leakage of liquid.
31	Lack of validation solution (E22)	<ol style="list-style-type: none"> 1. Check the current process, if it is verification (including manual verification and automatic verification), check whether the standard solution in the verification bottle is used up or missing; 2. Check whether the liquid tube has been inserted into the bottom of the standard solution bottle; 3. Check whether the solution inlet of the validation solution bottle and the electronic rotary valve port 2 have a solution backflow; if it is, tighten the corresponding connection terminal; 4. After all the above steps are checked and resolved, re-run the analysis program to see if the fault has been eliminated; if the fault still occurs, please contact the after-sales personnel to determine the fault and repair it.

Note: For the error information items listed in **Table 12**, it is necessary to find the root cause of the problem and eliminate the problem, and then restart the measurement operation. When the next round of initialization operation is performed, the system will reconfirm the relevant error information. If the problem is detected to have been eliminated, the error information would automatically disappear.

Customer Service

Compliance Precautions

This equipment would generate, use and radiate radio frequency energy. If not installed and used according to the User Manual, it may cause interference to radio communication. This equipment has been tested in accordance with Part 15, Subpart J, of the FCC Rules and is deemed to meet the restrictions on Class A computing equipment and can provide reasonable interference protection for operation in a commercial environment. The operation of this equipment in residential areas may cause interference. Therefore, the user needs to take necessary measures to correct the interference at his own expense.

This digital equipment does not exceed the radio noise emission (Class A) limit for digital equipment specified in the Radio Interference Regulations of the Canadian Department of Communications.

Terms and Conditions

For products not listed in this warranty statement, please visit our website: www.thermofisher.com/processwater

Contact Information

For the latest contact information, please visit www.thermofisher.com/processwater

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Minimum Order

The minimum order amount required for Thermo Scientific Orion process products is \$100. This order is considered as a product purchase order shipped to a single location. The requirement of international minimum order amount may vary. For more details, contact the international coordinator.

Hazardous Materials

Some materials are corrosive/oxidizing agents specified by DOT and IATA and may require special marks and treatment. In addition, the material is forbidden to combine with other products. The freighter may incur additional freight charges for handling/transporting these materials. Additional freight charge will be charged according to the conditions of FOB. Notify the manufacturer of the shipping instructions for these dangerous goods to reduce the relevant freight charges.

Restock Fee

Permission must be obtained to return brand-new goods and excess inventory before returning goods. Under the condition of no reordering, if any goods are allowed to return due to wrong ordering and receive corresponding refund, a replenishment fee of 25% of the product price shall be paid. 25% of the replenishment fee for international customers will be paid according to the international price.

Only brand-new (in the box) goods can be returned within 30 days after the manufacturer's delivery. Used goods, 9 digital parts and discontinued items are not refundable to obtain corresponding refunds.

Shipment Discrepancy

The manufacturer must be informed of any goods or document discrepancy within 30 days since receiving the invoice. All confirmed claims for short shipment will be settled by refund notices or new orders. Any claim for discrepancy in shipment made after 30 days since the date of invoice will not be accepted and the manufacturer will not provide any refund.

Shipment Delay

The manufacturer shall not be liable for any failure or delay in fulfilling orders due to fire, flood, strike or other labor difficulties, natural disasters, acts of government authorities or buyers, riots, bans, shortage of fuel or energy, transportation accidents or delays, inability to obtain required labor, materials or manufacturer's facilities from general sources, or reasons beyond the manufacturer's control. In case of delay in fulfilling orders due to any of the above reasons, the order delivery date or fulfillment completion time shall be reasonably extended for a period to cope with the impact of the delay.

Process products used in foreign nuclear facilities shall conform to the manufacturer's nuclear terms and conditions. If there is no copy of the nuclear terms and conditions, contact the manufacturer.

Except for the terms of this warranty, any inconsistent statement and warranty made by any person (including authorized distributors, dealers, representatives and employees of the manufacturer) shall not be binding on the manufacturer, unless the written consent or signature of an official from the manufacturer has been gained.

Warranty

According to the operation restriction and maintenance procedures given in the User Guidelines, Thermo Scientific Orion process products are guaranteed to be free from material and process defects within 12 months from the date of installation or 15 months after shipment, whichever is earlier, when used under normal operating conditions or under the condition without the occurrence of any accident, change, misuse or abuse. This warranty is based on the premise that the consumables (all solutions) are stored in non-corrosive air at temperatures between 5°C and 45°C (40°F and 110°F) and within the storage life printed on the product.

In case of the occurrence of failure during the warranty period, the manufacturer or the authorized distributor selected by the manufacturer will repair or replace the unqualified product according to the above warranty terms or refund the purchase price of the product.

The warranty mentioned above is the only warranty certificate of Thermo Fisher Scientific for the product. All other forms of warranties, whether statutory, express or implied (including but not limited to implied warranty of product performance), or for other purposes and all warranties arising from trading habits or business practices, are not recognized by the company. The only solution enjoyed by the buyer is to repair or replace unqualified parts or refund the purchase price of the product. However, the manufacturer (including its contractors and suppliers) shall not be liable to the buyer or any person for special indirect, accidental or corresponding losses, regardless of the requirements in the contracts, torts (including negligence) or requirements arising from the supplied product.

Accessories Information

Consumables, Parts and Accessories

For Analyzer, Accessories, Reagents, etc., refer to the following table for order number information:

Table 13. Ordering Information of for Analyzer, Consumables and Related Accessories

Order number	Description
8010CX	Orion 8010cX Ammonia Analyzer
8010RFG220	220 V Reagent 2 refrigerator (mainly applicable to Chinese and European markets)
8010RFG115	115 V Reagent 2 refrigerator (mainly applicable to North American market)
8010FSC	Floor cabinet (can be used to contain refrigerator, waste liquid tank and deionized water tank, etc.).
8010PCM	Profibus communication module
CIC0000126	Flow cell module
8010RE	Reagents packet (including Reagent 1, Reagent 2A, Reagent 2B and Reagent 3)
8010002	2 mg/L ammonia nitrogen standard solution
8010015	15 mg/L ammonia nitrogen standard solution
8010030	30 mg/L ammonia nitrogen standard solution
8010100	100 mg/L ammonia nitrogen standard solution
8010500	500 mg/L ammonia nitrogen standard solution

Manufacturer:
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Regulatory

FCC Statement

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian ISED IC Notice

This ISM digital apparatus complies with Canadian ICES-001. Cet appareil ISM est conforme à la norme NMB-001 du Canada.

WARNING Statement: EMC Registration is done on this equipment for business use only. It may cause interference when the product would be used in home. This warning statement applies a product for business use.

Korea KC

사용자 안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

WARNING Statement: EMC Registration is done on this equipment for business use only. It may cause interference when the product would be used in home. This warning statement applies a product for business use.



Australia / New Zealand RCM

This product complies with all applicable standards for Australia and New Zealand.

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